Effect of organic and inorganic fertilizers on yield of broad bean plant grown on West Delta region.

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ABSTRACT

A filed experiment was conducted to study the influence of organic and inorganic fertilizers on productivity and nutrients contents of Faba bean plants (*Vicia faba,* L) grown on three locations at West Delta Egypt, Kafr El Waq, Housh Issa (S_1) and El Lohom Nubaria (S_2) are located in El Behira Governorate and the third one is the farm of Faculty of Agriculture Al-Azhar university in EL-Sadate City; El Monoufia Governorate (S_3), during winter season of 2018-2019 years. The results revealed that applying organic and inorganic fertilizers significantly increased straw yield, seeds yield, weight of 100 seeds and nutrients contents of the grown faba bean plants. The values record at S_1 were higher than those attained at S_2 in where corresponding values were achieved higher than those achieved at S_3. The values were 4949.784 and 4940.784 and 4761.952 k/ha for straw yield at S_1, S_2 and S_3 sites respectively corresponding to 4914.062, 4637.065 and 4536.677 kg/ha for seed yield at the same respective sites and 109.801, 107.033 and 107.018 g for weight of 100 seeds at S_1, S_2 and S_3, respectively. The highest values for N concentration in straw were1.67, 1.57 and 1.62%corresponding to N uptake values of 62.00, 58.18 and 57.86 kg/ha at S_1, S_2 and S_3, respectively. Likewise, the highest values of nitrogen concentration in seeds were 3.56, 3.44 and 3.31%corresponding to the highest N uptake values of 131.21, 119.64 and 112.62 kg/ha at S_1, S_2 and S_3, respectively.

Key words: faba bean, fertilizers, nutrient contents.

INTRODUCTION

Faba bean (*Vicia faba,* L) is one of the most abundant legumes in Egypt for feeding, both for people and animals. Several investigations found that the suitable fertilization increased the yield quantity and quality.

The effect of fertilization with (nitrogen, phosphorus, and potassium) applied at a rate of 75 %, NPK 100 %, NPK 75 % + compost and NPK 100 % + compost, in addition of the control, recommended dose at rates of 100 Kg N. fed^{-1} 200 Kg P_2O_5 fed^{-1} and 50 Kg K_2O fed^{-1}, and 20 m^3 fed^{-1} respectively was studied by Fouda *et al.* (2017). Their results revealed that the best treatment was NPK 100 % + compost, compared to control. The highest value of vegetate growth parameter strengthened quality parameters (NPK, carbohydrate, and protein of seed %). It also improved chlorophyll content of bean plant. The NPK 100 % + compost treatment fostered NPK % in leaves and increased yield. It also increased available nutrients NPK in soil. Veget and Flori (2018) evaluated that the impact of FYM, inorganic is (100%, 75% and 50% NPK of recommended doses); they found significant increase in all studied characters compared with untreated plants, except nitrate concentration; the interaction treatment among FYM at the rate of 20 m^3/fed, 75% NPK from recommended doses, Therefore, this treatment could be recommended for improving okra production and decrease the amount of inorganic fertilizer under similar condition of this study. Mohamed and El-Yazal (2020) pointed out that organic fertilized crops led to the above values of accretion mostly weighting 100 seeds and weight of seeds / plant). Owusu-Sekyere (2021) pointed out that inorganic (Nitrogen, phosphorus and potassium) and organic addition led to increased seed yield about 10-32%, shoot and root dry matter on average by 36% and 21% respectively in mature crops. Uptake of micronutrients and use efficiencies were commonly lower in organic- crops than in NPK-crops. Results also revealed increased seed Fe (3-28%), Zn (10-26%) and Cu (6-31%) in NPK and organic-transact crops.

The present study aims to evaluate the influence of organic and inorganic fertilization on the faba bean yield for West Delta region.

MATERIALS AND METHODS

A field experiment was carried out at three locations, two of them i.e. Kafr El Waq, Housh Issa (S_1) and El Lohom, Nubaria (S_2) are located in El Behira Governorate and the third one is the Farm of Faculty of Agriculture Al-Azhar university in EL-Sadate City; El Monoufia Governorate (S_3). The aim of this work was to study the effect of organic and inorganic fertilization on productivity and

nutrient contents of faba bean (*Vicia faba*, L, Nubaria 1), during winter season 2018/2019 years. The experimental design was split design with three replicates.

Organic fertilizers were the farm wastes (Farmyard manure). Inorganic fertilizers used were ammonium nitrate (33.5% N) and super phosphate (12.5%P_2O_5) and potassium sulphate (50% K_2O).

The treatments of inorganic fertilizers were T_0 (control), T_1 (25%), T_2 (50%) and T_3 (100%) of the recommended doses kg/ha of nitrogen, phosphorus and potassium fertilizers respectively. Fe, Zn, and Mn were foliarly added - as EDTA at a rate of 0.5 g/L whereas Cu was sprayed in the form of copper sulphate at a rate of 0.1 g/L. The organic manure (FYM) was applied at a rate 23.80 m^3/ha of O_0 (control), O_1 (50 %) and O_2 (100 %) of recommended doses m^3/ha.

After the experiment duration (150 days from sowing) soil and plant materials were collected and prepared according to the usual methods. They were kept for the lab analysis. Soil samples were collected before cultivation; and analyzed according to Klute (1986) for the determination of physical properties and Page *et al*. (1982) for the determination of chemical properties estimated i.e., EC, pH, $CaCO_3$%, organic matter and soluble ions available elements in soil before cultivation were extracted using ammonium bicarbonate-DTPA according to Soltanpour and Schwab (1977). Results of the aforementioned properties are presented in Table 1.

Also, some chemical properties of the applied organic manure and irrigation water are presented in Tables 2 and 3**.**

At the end of the experiment (after 150 days from sowing), the plants were harvested. Seeds yield, straw yield and weight of 100-seeds were evaluated. Plant samples were collected and prepared for analysis. Representative portions were wetly digested using $HClO_4$ and H_2SO_4 acids to determine NPK and micronutrients. Total N was determined by micro-Kjeldahl technique while total P was determined by ascorbic acid method. Total K was determined using flame photometer. Micronutrients were determined by Spectrometer (ICP) plasma 400; According to Page *et al.* (1982).

The data were statistically analysis according to Gomez and Gomez (1984). When the F-test showed significant differences among means, Least Significant Differences (LSD) test was performed at the 0.05 level of probability.

RESULTS AND DISCUSSION

The obtained results all over the investigation are tabulated in Tables (4), (5), (6), (7), (8) and (9) in the Appendix.

These results show clear significantly in all the estimated plant parameters due to the investigated treatments.

Influence of organic and inorganic fertilization on dry weight of the straw, seed and weight of 100 seed (g) of faba bean plants.

Data presented in Table (10) show that the highest values of the straw yield were 4949.784, 4940.784 and 4761.952 (kg/ha) obtained with T_3 (100% inorganic fertilizers) and 100% organic manure (FYM) treatments at S_1, S_2 and S_3 respectively. These increases in dry matter of the straw yield can be ascribed to a direct role for both the inorganic fertilizers and organic manure in plant growth where they are considered as sources of the required necessary macro and micronutrients in available forms during the growth season beside the role of the organic manure in improving chemical and physical properties of soils. These results are in agreement with those of Sanchez *et al.*(2001), Chaterjee *et al.* (2005) who found that the treatment of beans with nitrogen, phosphorus and potassium caused increases for all yield ingredients, 100-seed weight and yield (ha). The deduced optimum fertilization proportion was 0.0-76-57 kg for N, P and K, kg/ha respectively.

Table (10) reveals that the highest values for seed yield were 4914.062, 4637.065 and 4536.677 kg/ha due to T_3 and O_2 treatments at S_1, S_2 and S_3, respectively, while the least value was 4233.124 (kg/ha) obtained for T_1 and O_2 treatments at S_3. The results obtained herein seem to be in correspondence with Ahmed (2016) who stated that the increase in dry matter yield may be attributed to a direct role of inorganic fertilizer and organic manure on plant growth as a source of all necessary macro and micronutrients in available forms during the growth season and improving physical and chemical properties of soils.

Similar trends were almost observed for all the investigated parameters.

Considering the effects of the used treatments on weight of 100 seed (g), data in Table (10) reveal that the highest values for weight of 100 seed (g) were obtained at S_1 then

S_2 where its values were more than the corresponding ones obtained at S_3. The highest values of 100 seed weight (g) were 109.801, 107.033 and 107.018 g for S_1, S_2 and S_3 respectively. These results agree with those obtained by Botos *et al*. (2009) who showed that the increase in yield of faba bean due to nitrogen fertilizer application was between 21% upon application of 30 kg N/ha.) and 56% (upon application of 90 kg N/ha.).

Influence of organic and inorganic fertilization on some macronutrients concentration.

Data in Table (10) show that the highest values of nitrogen concentration (%) in straw were 1.67, 1.57 and 1.62 (%) obtained due to T_3 and O_2 treatments at S_1, S_2 and S_3, respectively. These increases in nitrogen concentration (%) in straw are probably due to the effect of the applied fertilizers on increasing the dry matter yield of the straw. These results are in agreement with those of Ahmed (2016) and Hafiz *et al.* (2012) who stated that the increase is linear and significant with the increase in the rate of the nitrogen application.

Regarding the effect of the different treatments on the nitrogen concentration (%) in the seeds, data prefixed in Table (10) reveal that the highest nitrogen concentration (%) in the seeds were 3.56, 3.44 and 3.31 (%). These values were obtained due to T_3 and O_2 treatments at S_1, S_2 and S_3 sites successively. This may be may be attributed to the N content in both the inorganic and organic fertilization on one hand and the effect of the applied organic manure on reducing the pH of the soil as a result of dissolution of the CO_2 exhaled by the organic manure – decomposers on the other hand. The reduction occurred in soil pH might facilitate the uptake of the nitrogen and thus increased its concentration seeds.

Regarding the effect of treatments on nitrogen uptake by straw, data in Table (10) reveal that the highest values of nitrogen uptake were 62.00, 58.18 and 57.86 (Kg/h) for S_1, S_2 and S_3 respectively. The highest N uptake values were obtained due to the treatment T_3 and O_2. These results are in agreement with Majumdar *et al.* (2003). With regard to the effect of treatments on nitrogen uptake (kg/ha) by the seeds, data in Table (10) show that the highest nitrogen uptake values i.e., 131.21, 119.64 and 112.62 kg/ha at S_1, S_2 and S_3 successively were achieved due to the treatment T_3 and O_2. These results are in accordance with those of Sobkowicz and Sniady (2004) and Bhowmik *et al.* (2012) who showed that N, P and K uptake increased with the increase in the level of phosphate fertilizer up to 60 kg/ha in faba bean plants.

Data tabulated in Table (10) revealed that the highest phosphorus concentration (%) in straw were 0.219, 0.201 and 0.211 (%) obtained due to T_3 and O_2 treatments at S_1, S_2 and S_3 respectively. Similar results were obtained by Bhowmik *et al*. (2012) who indicated that N, P and K uptake increased with the increase in the level of phosphate fertilizer up to 60 kg/ha in faba bean plants.

With regard to the effect of treatments on the phosphorus concentration (%) in the seeds, data foreword in the same Table (10) revealed that the highest phosphorus uptake values (kg/ha) were 8.13, 7.45 and 7.54 at S_1, S_2 and S_3 respectively. These values were achieved due to the treatment T_3 and O_2. These results are in agreement with Yakout and Greish (2001) who showed that the soil application of phosphorus with or without bio fertilizer (microbein) along with foliar fertilization (stimphol) significantly increased the yield, yield components and quality of faba bean.

With regard to the effect of treatments on phosphorus uptake by seeds, data in Table (10) reveal that the highest phosphorus uptake values were 13.97,10.36 and 8.03 (kg/ha) at S_1, S_2 and S_3 due to the treatment T_3 and O_2. These results confirm the data obtained by Ahmed *et al.* (2005) who indicated that all studied parameters seeds yield, straw yield, protein percentage in seeds and phosphorus uptaken by the seeds significantly increased due to increasing the level of phosphorus fertilization from 0.0 to 30 or 45 kg P_2O_5/fed.

Data in Table (10) reveal that the highest potassium concentrations (%) in straw were 0.82, 0.80 and 0.80 (%) obtained with T_3 and O_2 treatments at S_1, S_2 and S_3, respectively. These increases in potassium concentration (%) in straw perhaps occurred due to the applied inorganic fertilizer and organic manure on enhancing the growth plant parameters through supplying it with the most necessary nutrients in available forms during the growth season beside the improving effect on soil properties. These results are pertinent to Helall *et al.* (2009) who found that executed two field experiments to investigate the impact of compost and town refuses (as organic amendments; OA) application on growth and yield parameters nutrient availability and uptake by faba bean plant. Their data showed that application of OA increased yield of faba

bean which were more in seeds and in case of straw.

With regard to the effect of treatments on the potassium concentration (%) in the seeds, data displayed in Table (10) reveal that the highest potassium concentrations in the seeds were 2.29, 2.28 and 2.29 (%). They were obtained due to T_3 and O_2 treatments at S_1, S_2 and S_3, respectively. This probably is grown to the effect of both the applied inorganic fertilizer and organic manure on soil properties in the root zone, root activity, nutrient absorption and the consequent complimentary effect that resulted in supreme potassium concentration.

Table (10) reveals that the potassium uptake values by the straw of the grown plants followed the sequence $S_1 > S_2 > S_3$.. The highest values of potassium uptake by the straw were 30.44, 30.02 and 28.93 (kg/ha) for S_1, S_2 and S_3, sited respectively. These results are in an opposite trend with Malakouti (2004).

With regard to the effect of treatments on potassium uptake by the seeds, data presented in Table (10) reveal that the potassium uptake values by the seeds of the plants grown in S_1 exceeded the corresponding values at S_2 which were more than the corresponding ones at S_3.. The highest values of potassium uptake by the seeds were 84.40, 79.29 and 77.92 (kg/ha) for S_1, S_2 and S_3, respectively. These results are in agreement with Sanchez *et al.* (2001) who found that potassium increased the plant height but not the number of branches.

Influence of organic and inorganic fertilization on some micronutrients concentration.

Data in Table (10) show that the highest iron concentrations in straw were 341.14, 339.16 and 361.39 mg/kg obtained with T_3 and O_2 treatments at S_1, S_2 and S_3, respectively. These increases in iron concentration in straw can be attributed to the effects of the inorganic and organic fertilizer on plant growth as sources of servals necessary macro and micronutrients in available forms during the growth season beside of the improving effect of the applied organic manure on both the physical and chemical properties of soils. These results are in accordance with Cakmak and Kutman (2018) who indicated that cereal crops zinc increased with increasing foliar application.

Table (10) shows that the highest zinc concentrations in straw were 35.18, 36.91 and 36.11 (mg/kg) obtained with T_3 and O_2 treatments at S_1, S_2 and S_3, respectively. These results are in agreement with Berger *et al.* (2002) who found that they have reported differences in straw and seed yield of faba bean genotypes. Table (10) shows that the highest manganese concentrations in straw were 43.19, 43.10 and 42.56 (mg/kg) obtained with T_3 and O_2 treatments at S_1, S_2 and S_3 respectively. These increases in manganese concentration in straw may be attributed to the beneficial effect of the applied inorganic fertilizer and organic manure on plant growth and the improving effect of the applied organic manure on both the physical and chemical properties of soils besides its effect on the soil microbial activity and creation of more favorable environment for root growth and nutrient availability. These results are in agreement with Berger *et al.* (2002).

Data in Table (10) reveal that the highest iron concentrations in the seeds were 391.16, 378.12 and 379.17 (mg/kg obtained with T_3 and O_2 treatments at S_1, S_2 and S_3, respectively. These results are compatible with those of Baloch *et al*. (2014), and Majumdar *et al*. (2003) who pointed that fertilizers increased the uptake of N, P, S and Zn. Synergistic interactions were found between P and S, P and Zn, and S and Zn, all of which increased grain yield and nutrient uptake by faba bean.

Table (10) reveals that the highest zinc concentration (mg/kg) in the seeds were 41.16, 41.39 and 34.21 (mg/kg) obtained with T_3 and O_2 treatments at S_1, S_2 and S_3 respectively. These results are unisonous with Botos *et al.* (2009). Table (10) reveals that the highest manganese concentration (mg/kg) in the seeds were 51.18, 50.21 and 50.18 (mg/kg) obtained with T_3 and O_2 treatments at S_1, S_2 and S_3 respectively. This can be likely attributed to the effect of the applied inorganic fertilizer and organic manure improving the soil physico-chemical environment in the root zone. These results are in agreement with Graham *et al.* (2007) who pointed out that increasing foliar application with manganese led to increasing manganese concentration.

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Table 1: Some physical and chemical properties of the investigated soils before cultivation.

Property			S_1	S_2	S_3
Particle size distribution, %		Sand	20.93	57.16	62.33
		Silt	32.65	23.13	21.38
		clay	46.42	19.71	16.29
Textural class			Clay	Sandy loam	Sandy loam
O.M mg kg^{-1}			11.30	9.10	5.70
Ca CO_3 g kg^{-1}			31.10	101.00	20. 00
pH (Soil paste)			8.10	8.01	7.63
EC (dSm^{-1}, at 25 C^o) 1:5			0.057	0.45	1.16
Soluble ions (mmolc L^{-1})	Cations	Ca^{+2}	0.70	1.00	1.18
		Mg^{+2}	1.00	0.50	1.60
		Na^{+}	3.50	2.80	6.50
		K^{+}	0.50	0.20	2.32
	Anions	CO_3^{-2}	-	-	-
		HCO_3^{-}	1.80	0.40	2.70
		CL	2.50	2.50	5.80
		SO_4^{-2}	1.43	1.60	3.10
Total (mg kg^{-1})		N	43.01	65.86	80.64
Available (mg kg^{-1})		P	4.50	18.00	45.00
		K	210.00	71.70	41.10
		Fe	15.20	7.40	3.60
		Zn	2.80	1.20	1.16
		Mn	10.70	5.40	1.40

Table 2: Some chemical properties of the applied organic manure.

Material	pH 1:5	EC dSm-1	C:N ratio	O.M g kg-1	N %	P %	K %	Fe mgkg-1	Zn mgkg-1	Mn $mgkg^{-1}$
F.Y.M	7.13	1.69	16:10	31.59	1.12	0.49	0.92	360.00	32.00	91.00

Table 3: Some properties of irrigation water.

Soil location	pH	EC ds.m-1	Property: Soluble cations mmolc/ L				Soluble anions mmolc/ L			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	CO_3^{--}	HCO_3^{-}	Cl^{-}	SO_4^{--}
S1(canal)	7.18	0.53	2.36	1.14	1.67	0.13	-	2.20	2.63	0.47
S_2 (canal)	7.31	0.57	2.11	1.23	2.21	0.15	-	2.36	2.93	0.41
S_3 (well)	7.92	0.79	2.69	1.15	3.87	0.19	-	4.10	3.12	0.68

Table 4: Influence of organic and inorganic fertilization on the yield of straw, seed and 100-seed weight of faba bean crop.

Inorganic fertilizers organic manure	straw yield (kg/h)				seed yield (kg/h)				100-seed weight (g)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
						S_1						
O_0	3301.356	3755.018	4378.678	4537.788	2576.085	3170.079	4230.180	4491.455	80.884	85.868	90.495	98.288
O_1	3549.687	4157.125	4661.953	4745.397	2771.195	3943.794	4686.731	4741.619	83.724	88.740	96.021	104.262
O_2	3886.794	4443.344	4884.896	4949.784	3459.299	4664.787	4913.951	4914.062	87.952	92.122	101.012	109.801
LSD at 5%	A (0.479), B (0.415) and AB (0.831)				A (0.696), B (0.603) and AB (1.201)				A (0.602), B (0.522) and AB (1.043)			
						S_2						
O_0	3223.912	3678.630	4193.791	4651.565	2462.531	2934.804	3934.905	4297.901	79.878	83.764	89.583	96.315
O_1	3493.632	4105.792	4495.344	4779.674	2641.418	3835.351	4442.067	4620.343	82.168	86.131	93.992	102.114
O_2	3811.906	4332.401	4826.730	4940.784	3163.635	4550.954	4613.621	4637.065	87.151	89.745	99.027	107.033
LSD at 5%	A (0.730), B (0. 632) and AB (1. 265)				A (0.765), B (0.663) and AB (1.327)				A (0.567), B (0.491) and AB (0.982)			
						S_3						
O_0	3062.192	3511.965	3973.071	4511.899	2369.699	2865.416	3882.295	4150.903	79.107	83.182	88.658	95.053
O_1	3458.299	3934.238	4323.123	4584.343	2615.918	3824.295	4357.123	4491.955	81.213	84.966	93.801	101.329
O_2	3664.741	4302.179	4339.345	4761.952	3106.524	4233.124	4476.844	4536.677	85.771	89.650	98.611	107.018
LSD at 5%	A (0.708), B (0.613) and AB (1.225)				A (0.628), B (0.544) and AB (1.088)				A (0.482), B (0.418) and AB (0.835)			

Where: S_1, clay soils; S_2, sandy loam soils and S_3, sandy loam soils.

Table 5: Influence of organic and inorganic fertilization on nitrogen concentration and uptake of straw and seeds of faba bean crop.

inorganic fertilizers / organic manure	straw								seeds							
	N concentration (%)				N uptake (Kg/h)				N concentration (%)				N uptake (Kg/h)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
							S_1									
O_0	1.17	1.30	1.52	1.59	28.97	36.61	49.92	54.11	0.91	1.91	2.74	3.16	17.58	45.41	86.93	106.45
O_1	1.23	1.49	1.56	1.66	32.75	46.46	54.54	59.08	1.12	2.13	2.98	3.41	23.28	63.00	104.75	121.27
O_2	1.32	1.53	1.60	1.67	38.48	50.99	58.62	62.00	1.93	2.87	3.18	3.56	50.07	100.41	117.20	131.21
LSD at 5%	A (0.003), B (0.002) and AB (0.004)				A (0.001), B (0.001) and AB (0.002)				A (0.002), B (0.002) and AB (0.003)				A (0.007), B (0.005) and AB (0.010)			
							S_2									
O_0	1.13	1.25	1.43	1.48	27.32	34.49	44.98	51.63	0.85	1.42	2.11	2.93	15.7	31.26	62.27	94.45
O_1	1.21	1.34	1.49	1.53	31.7	41.26	50.24	54.85	0.96	1.65	2.82	3.21	19.02	47.46	93.95	111.23
O_2	1.28	1.45	1.51	1.57	36.59	47.11	54.66	58.18	1.44	2.13	3.12	3.44	34.17	72.7	107.96	119.64
LSD at 5%	A (0.003), B (0.002) and AB (0.005)				A (0.007), B (0.005) and AB (0.011)				A (0.003), B (0.002) and AB (0.005)				A (0.008), B (0.006) and AB (0.012)			
							S_3									
O_0	0.97	1.16	1.38	1.46	22.28	30.55	41.12	49.41	0.79	1.09	1.90	2.76	14.04	23.42	55.32	85.92
O_1	1.13	1.32	1.42	1.52	29.31	38.95	46.04	52.26	0.83	1.61	2.19	3.12	16.28	46.18	71.57	105.11
O_2	1.19	1.39	1.50	1.62	32.71	44.85	48.82	57.86	1.11	1.92	2.82	3.31	25.86	60.96	94.69	112.62
LSD at 5%	A (0.004), B (0.003) and AB (0.007)				A (0.002), B (0.001) and AB (0.002)				A (0.005), B (0.004) and AB (0.007)				A (0.003), B (0.002) and AB (0.004)			

Table 6: Influence of organic and inorganic fertilization on phosphorous concentration and uptake of straw and seeds of faba bean crop.

inorganic fertilizers / organic manure	straw								seeds							
	P concentration (%)				P uptake (Kg/h)				P concentration (%)				P uptake (Kg/h)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
							S_1									
O_0	0.129	0.158	0.179	0.189	3.19	4.45	5.88	6.43	0.142	0.148	0.176	0.241	2.74	3.52	5.58	8.12
O_1	0.138	0.169	0.188	0.211	3.67	5.27	6.57	7.51	0.149	0.166	0.192	0.299	3.10	4.91	6.75	10.63
O_2	0.162	0.181	0.201	0.219	4.72	6.03	7.36	8.13	0.158	0.178	0.263	0.379	4.10	6.23	9.69	13.97
LSD at 5%	A (0.001), B (0.001) and AB (0.002)				A (0.002), B (0.001) and AB (0.003)				A (0.001), B (0.001) and AB (0.002)				A (0.004), B (0.006) and AB (0.009)			
							S_2									
O_0	0.128	0.14	0.168	0.182	3.09	3.86	5.28	6.35	0.132	0.141	0.156	0.210	2.44	3.10	4.6	6.77
O_1	0.131	0.151	0.171	0.199	3.43	4.65	5.77	7.13	0.139	0.156	0.171	0.231	2.75	4.49	5.7	8.00
O_2	0.143	0.169	0.189	0.201	4.09	5.49	6.84	7.45	0.142	0.160	0.214	0.298	3.37	5.46	7.4	10.36
LSD at 5%	A (0.001), B (0.001) and AB (0.002)				A (0.002), B (0.002) and AB (0.004)				A (0.001), B (0.001) and AB (0.002)				A (0.002), B (0.001) and AB (0.003)			
							S_3									
O_0	0.126	0.139	0.161	0.176	2.89	3.66	4.8٠	5.96	0.131	0.138	0.148	0.161	2.33	2.97	4.31	5.01
O_1	0.130	0.146	0.169	0.198	3.37	4.31	5.48	6.81	0.136	0.142	0.156	0.202	2.67	4.07	5.10	6.81
O_2	0.141	0.156	0.180	0.211	3.88	5.03	5.86	7.54	0.140	0.150	0.172	0.236	3.26	4.76	5.78	8.03
LSD at 5%	A (0.001), B (0.001) and AB (0.002)				A (0.003), B (0.002) and AB (0.004)				A (0.001), B (0.001) and AB (0.002)				A (0.007), B (0.005) and AB (0.010)			

Table 7: Influence of organic and inorganic fertilization on potassium concentration and uptake of straw and seeds of faba bean crop.

inorganic fertilizers organic manure	straw								seeds							
	K concentration (%)				K uptake (Kg/h)				K concentration (%)				K uptake (Kg/h)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
							S_1									
O_0	0.51	0.57	0.7	0.77	12.63	16.05	22.99	26.21	1.88	1.96	2.14	2.12	36.32	46.60	67.89	71.41
O_1	0.56	0.66	0.76	0.79	14.91	20.58	26.57	28.12	1.92	2.10	2.21	2.19	39.91	62.11	77.68	77.88
O_2	0.58	0.72	0.78	0.82	16.91	23.99	28.58	30.44	1.98	2.16	2.23	2.29	51.37	75.57	82.19	84.40
LSD at 5%	A (0.004), B (0.003) and AB (0.006)				A (0.008), B (0.006) and AB (0.013)				A (0.003), B (0.002) and AB (0.005)				A (0.008), B (0.006) and AB (0.011)			
							S_2									
O_0	0.50	0.56	0.68	0.77	12.09	15.45	21.39	26.86	1.86	1.95	2.10	2.01	34.35	42.92	61.97	64.79
O_1	0.56	0.62	0.77	0.78	14.67	19.09	25.96	27.96	1.90	1.99	2.18	2.11	37.64	57.24	72.63	73.12
O_2	0.58	0.69	0.79	0.81	16.58	22.42	28.6	30.02	1.96	2.13	2.20	2.28	46.51	72.70	76.12	79.29
LSD at 5%	A (0.004), B (0.003) and AB (0.005)				A (0.008), B (0.006) and AB (0.012)				A (0.004), B (0.003) and AB (0.006)				A (0.008), B (0.006) and AB (0.012)			
							S_3									
O_0	0.51	0.56	0.67	0.78	11.71	14.75	19.96	26.39	1.87	1.95	2.09	2.03	33.24	41.91	60.85	63.20
O_1	0.57	0.61	0.78	0.79	14.78	18.00	25.29	27.16	1.91	2.01	2.17	2.12	37.47	57.65	70.91	71.42
O_2	0.58	0.69	0.80	0.81	15.94	22.26	26.04	28.93	1.97	2.11	2.19	2.29	45.90	66.99	73.53	77.92
LSD at 5%	A (0.004), B (0.003) and AB (0.006)				A (0.009), B (0.006) and AB (0.013)				A (0.004), B (0.003) and AB (0.005)				A (0.004), B (0.003) and AB (0.006)			

Table 8: Influence of organic and inorganic fertilization on iron, zinc and manganese concentration (mg/kg) of straw of faba bean crop.

inorganic fertilizers organic manure	Fe (mg/kg)				Zn (mg/kg)				Mn (mg/kg)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
						S_1						
O_0	260.13	288.15	310.12	328.19	16.23	21.86	16.23	32.41	17.13	28.18	32.21	38.13
O_1	273.15	298.15	320.13	339.31	19.21	26.13	27.39	34.15	23.14	31.15	36.33	41.17
O_2	291.11	317.12	339.15	341.14	23.51	29.19	31.16	35.18	29.29	34.31	39.17	43.19
LSD at 5	A (0.0002), B (0.0002) and AB (0.0004)				A (0.001), B (0.001) and AB (0.002)				A (0.001), B (0.001) and AB (0.002)			
						S_2						
O_0	260.11	279.18	299.03	321.10	15.11	22.56	26.89	31.19	15.13	22.19	30.29	39.35
O_1	256.15	289.15	313.15	331.18	19.41	26.17	31.15	34.18	19.51	27.18	35.49	40.41
O_2	280.13	311.17	329.11	339.16	23.39	28.13	33.16	36.91	23.56	31.81	41.14	43.10
LSD at 5	A (0.0003), B (0.0002) and AB (0.0004)				A (0.0004), B (0.0003) and AB (0.0005)				A (0.001), B (0.001) and AB (0.001)			
						S_3						
O_0	261.16	281.18	310.25	329.23	14.41	21.356	27.19	32.15	17.09	27.10	32.14	37.16
O_1	257.13	289.25	317.15	343.31	18.31	25.14	30.10	35.59	23.12	30.14	35.21	40.49
O_2	283.17	316.25	334.16	361.39	23.11	29.12	33.17	36.11	28.31	34.39	38.82	42.56
LSD at 5	A (0.0002), B (0.0002) and AB (0.0004)				A (0.001), B (0.001) and AB (0.002)				A (0.001), B (0.001) and AB (0.002)			

Table 9: Influence of organic and inorganic fertilization on iron, zinc and manganese concentration (mg/kg) of seeds of faba bean crop.

(A)inorganic fertilizers (B)organic manure	Fe (mg/kg)				Zn (mg/kg)				Mn (mg/kg)			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
						S_1						
O_0	297.17	301.14	338.10	366.16	17.53	25.21	32.33	35.39	20.19	28.1	42.09	48.11
O_1	309.16	323.11	351.16	379.13	21.19	33.17	36.41	37.15	25.33	36.13	46.49	51.36
O_2	319.15	349.15	371.18	391.16	27.13	35.86	38.16	41.16	29.16	44.14	49.19	51.18
LSD at 5%	A (0.0060), B (0.0045) and AB (0.0090)				A (0.001), B (0.001) and AB (0.002)				A (0.001), B (0.001) and AB (0.002)			
						S_2						
O_0	281.14	298.13	329.16	350.11	16.17	25.14	32.13	34.10	18.42	30.61	41.5	46.15
O_1	293.17	311.15	343.13	361.19	22.15	33.16	35.91	37..21	26.33	35.16	45.19	48.18
O_2	301.16	331.18	356.15	378.12	26.16	34.15	37.11	41.39	31.21	44.19	49.36	50.21
LSD at 5%	A (0.0002), B (0.0002) and AB (0.0004)				A(0.0010), B(0.0008) and AB(0.0016)				A (0.001), B (0.001) and AB (0.002)			
						S_3						
O_0	289.13	296.11	330.10	351.13	16.29	23.12	32.39	34.19	19.81	27.16	42.17	47.15
O_1	291.15	312.15	341.11	363.18	19.15	31.41	35.17	36.10	25.46	36.13	45.19	49.10
O_2	302.16	333.14	357.09	379.17	25.86	34.36	37.11	34.21	29.33	43.21	49.13	50.18
LSD at 5%	A (0.0003), B (0.0002) and AB (0.0004)				A (0.001), B (0.001) and AB (0.001)				A (0.001), B (0.001) and AB (0.002)			

Table 10: The range of estimated values.

Value The investigated parameters	Maximum	Average	Minimum
Straw yield (kg/ha)	4949.784	4940.784	4761.952
Seed yield (kg/ha)	4914.062	4637.065	4536.667
Weight of 100 seeds (g)	109.801	107.033	107.018
Nitrogen concentration (%) in straw	1.67	1.62	1.57
Nitrogen concentration (%) in seeds	3.56	3.44	3.31
Nitrogen uptake (kg/ha) by straw	62.00	58.18	57.86
Nitrogen uptake (kg/ha) by seeds	131.21	119.64	112.62
Phosphorus concentration (%) in straw	0.219	0.211	0.201
Phosphorus concentration (%) in seeds	0.379	0.298	0.236
Phosphorus uptake (kg/ha) by straw	8.13	7.54	7.45
Phosphorus uptake (kg/ha) by seeds	13.97	10.36	8.03
Potassium concentration (%)in straw	0.82	0.81	0.81
Potassium concentration (%) in seeds	2.29	2.29	2.28
Potassium uptake (kg/ha) by straw	30.44	30.02	28.93
Potassium uptake (kg/ha) by seeds	84.40	79.92	79.29
Iron concentration (mg/kg) in straw	٣٦١,٣٩	341.14	339.16
Iron concentration (mg/kg) in seeds	391.16	379.17	378.12
Zinc concentration (mg/kg) in straw	36.91	36.11	35.18
Zinc concentration (mg/kg) in seeds	41.39	41.16	34.21
Manganese concentration (mg/kg) in straw	43.19	43.10	42.56
Manganese concentration(mg/kg) in seeds	51.18	50.21	50.18

تأثير الأسمدة المعدنية والعضوية على محصول الفول البلدى المنزرع في منطقة غرب الدلتا

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الملخص العربي

أقيمت تجربة حقلية لدراسة تأثير التسميد العضوى والتسميد المعدنى على إنتاجية ومحتوى العناصر فى نبات الفول البلدى صنف (نوبارية ١) خلال الموسم الشتوى لعام ٢٠١٨/٢٠١٩م فى ثلاث مواقع بغرب الدلتا بمصر. وكانت أهم النتائج المتحصل عليها كما يلي: كان لإضافة المعاملات من الأسمدة المعدنية والعضوية تأثير معنوي فى زيادة المادة الجافة من القش والبذور ومتوسط وزن ال١٠٠ بذرة. كان لإضافة المعاملات تأثير معنوي فى زيادة الكمية الممتصة من المغذيات الكبرى والصغرى بواسطة النبات. وتم الحصول على أفضل النتائج من الأراضى S_1 حيث أعطت محصول ٤٩٤٩,٧٨٤ كجم/هكتار من القش؛ و ٤٩١٤,٠٦٢ كجم/هكتار من البذور و كان متوسط وزن ال١٠٠ بذرة ١٠٩,٨٠١جم عند المعاملة ١٠٠٪ تسميد معدنى مع المعاملة ١٠٠٪ تسميد عضوى، ويليها الأراضى S_2 حيث كان محصول القش ٤٩٤٠,٧٨٤كجم/هكتار و٤٦٣٧,٠٦٥ كجم/هكتار للبذور وكان متوسط وزن ال١٠٠ بذرة ١٠٧,٠٣٣ (جم) عند نفس المعاملات السابقة، بينما فى الأراضى S_3 حيث كان محصول القش ٤٧٦١,٩٥٢ كجم/هكتار و ٤٥٣٦,٦٧٧ كجم/هكتار للبذور وكان متوسط وزن ال١٠٠ بذرة ١٠٧,٠١٨ جم، بينما كانت أعلى القيم لتركيز وامتصاص النيتروجين فى القش (١,٦٧، ١,٥٧، ١,٦٢ %) و (٦٢,٠٠، ٥٨,١٨، ٥٧,٨٦ كجم/هكتار) فى الأراضى S_1 ، S_2 ، S_3 على التوالى، بينما كانت أعلى القيم لتركيز وامتصاص النيتروجين فى البذور (٣,٥٦، ٣,٤٤، ٣,٣١ %) و (١٣١,٢١، ١١٩,٦٤، ١١٢,٦٢كجم/هكتار) فى الأراضى S_1 ، S_2 ، S_3 على التوالى.

الكلمات الاسترشادية: الفول البلدي، الأسمدة، محتوى العناصر.