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EFFECT OF SEED COATING WITH SOME MICRONUTRIENTS ON FABA BEAN (*Vicia faba L.)*
II- EFFECT ON YIELD, YIELD ATTRIBUTES AND MINERAL COMPOSTION.

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ABSTRACT

Two field experiments were conducted on the Experimental farm of El-Gemmeiza Agric.Res.Station,Agric.Res. Center for two seasons; 1998 /99 and 1999 /2000. The aim of these experiments was to evaluate the impact of coating faba bean seeds(Giza2variety) with certain micronutrients on the production and mineral composition of both faba bean seeds and straw. Zn, Mn and Fe were applied by seed coating method individually or in all possible combinations in EDTA form at rate of 0.3gm for either Zn or Fe and 0.15 gm for Mn / kg seeds. The mean results of the two growing seasons could be summarized as follows:

1- Yield components (number of branches and pods / m^2; plant height,cm; weight of seeds,gm / plant and 100 seed weight,g) as well as seed, straw and biological yields, kg/feddan were positively affected by the application of Zn, Mn and Fe either individually or in mixtures. In this respect, the maximum responses were observed in case of the triple treatment followed by the double and single treatments, in a descending order.
2- Among the dual treatments, the mixtures of (Zn+Fe) and (Zn+Mn) gave the highest increments for the above-mentioned parameters. Whilst, Zn and Fe gave values higher than those of Mn.
3- Nitrogen, phosphorus and potassium contents in both seeds and straw were significantly increased by seed coating with various micronutrient treatments especially with the triple one.
4- Application of the investigated micronutrients alone or in combinations caused significant increases in its content of both seeds and straw and also promoted the contents of the other micronutrients. Meanwhile, triple and dual treatments had the superiority effects.
5- Seed and straw yields were significantly correlated by its content of Zn, Mn and Fe as the following multiple regression equations:

$Y_1 = 429.4 + 2.9X_1^{**} + 3.3X_2 + 0.47X_3$ ($r^2 = 0.98$)
$Y_2 = 472.6 + 1.8X_1^{**} + 1.0X_2 + 0.52X_3$ ($r^2 = 0.93$)

Where;
Y_1 and Y_2 indicate the mean values of seed and straw yields, respectively in (kg/fed.).
X_1, X_2 and X_3 indicate the mean values of Zn, Mn and Fe content, respectively, in (g/fed).
** significant at 0.01 level.

Key words: (Faba bean-Seed coating- Zn-Mn-Fe).

INTRODUCTION

As faba bean takes the first place among the most important legumes raised in Egypt, back up research was been focussed on this particular crop to maximize its production through the efficient fertilization.

Micronutrients are not generally applied regularly to plants with common fertilizers and fertilizing with macronutrients only is likely to promote

imbalance between macro-and micronutrients as well as between individual nutrients. Furthermore, Egyptian soils have high pH and $CaCO_3$ content and low content of organic matter. Under such conditions, availability of most micronutrients to plants reduce (Mengel and Kirkby, 1982 and Amin et al.,1988).

The essential roles of micronutrients in plant metabolism, as activators or co-factors in all vital processes of plant cannot be ignored. This lead undoubtedly to increase the crop yield production which considered as the main goal in this respect (El-kabbany et al., 1996). In this connection, the increase in faba bean yield as affected by micronutrients has been reported by many workers such as Amin et al (1988); Osman et al.,(1991) and Azer et al (1992). They showed that application of micronutrients increased significantly all yield components as well as seed and straw yields. Amin et al., (1988) also found that seed and straw yields; 100-seed weight and grain nitrogen and mineral contents increased as the application of Zn, Mn, Fe and Cu simultaneously. Yet, Crawford et al., (1989) indicated that with both Mn deficiency and toxicity, accumulation rates of fresh weight, dry weight, N, P and K in cucumber plants, were lower than with Mn sufficiency.

There is no doubt that nutritional interaction between iron and zinc exists in plants. Lindsay and Norvell, (1969) indicated that the explanation for this interaction is not completely understood. Waly, (1996) on pea found that there is a competition effect for Zn application on Fe-content. However, Hassan, (1996) and Nassar (1997) on wheat hinted to the positive effect of Zn on Fe uptake. Mn-Fe interactions have also reported by many investigators. Some of them (Azer et al.,1992 and Waly, 1996) noticed that there is an antagonism relation between Mn and Fe. Whilst, the others (Ibrahim and Shalaby, 1994 and Nassar, 1997) reported that Mn application increases Fe-uptake.

Applications of micronutrients have historically been made to soil and foliage. Recently, additional method of application has been developed including seed coating by such micronutrients. Osman et al., (1991); Shams El-Din, (1993) and Nassar(1997) attributed the efficiency of seed coating methods with micronutrients to its effecting on the proliferation of roots through the soil. This lead the plant roots to absorb more nutrients and correct the suitable requirements of Zn, Mn and Fe for plants. Consequently, producing a high quantity and quality yield.

Therefore, the aim of this work was to through some light on the effect of Zn, Mn and/or Fe adding by seed coating method on the quantity and quality of faba bean grown under alluvial soil.

MATERIALS AND METHODS

Two field experiments were conducted on El-Gemmeiza Agric. Res. Station, Agric.Res. Center during the two successive seasons; 1998/99 and 1999/2000 to compare the effect of some micronutrients, i. e. Zn, Mn and Fe applied individually or in combinations as seed coating on faba bean production.

Soil samples were taken before sowing and prepared for determining physical and chemical properties as shown in Table (1).

Table (1): Physical and chemical analysis of investigated soil samples.

Season		1997/98	1998/99
1- Physical analysis:			
Coarse sand	(%)	3.14	2.26
Find sand	(%)	20.28	14.58
Silt	(%)	24.95	28.75
Clay	(%)	51.63	54.41
Soil texture		clayey	clayey
Total $CaCO_3$	(%)	3.33	4.12
Organic matter	(%)	1.65	1.80
II**- Chemical analysis :**			
PH (1 soil: 2.5 water suspension)		7.90	8.10
EC (dS/m, 1 soil : 5 water extract)		1.25	1.58
Soluble ions (m.eq. /100 g soil, 1 soil : 5 water extract)			
1- Cations :			
Ca^{++}		1.10	1.50
Mg^{++}		0.90	1.30
Na^{+}		4.10	4.70
K^{+}		0.20	0.40
2- Anions :			
CO_3^{--}		--	--
HCO_3^{-}		1.40	1.70
Cl^{-}		4.00	5.00
SO_4^{--}		0.90	1.20
Available nutrients (ppm):			
1- Macronutrients:			
N (1 % Potassium sulphate extract)		21.20	25.00
P (1 M sodium bicarbonate extract)		8.00	9.60
K (1 M ammonium acetate extract)		440.00	498.00
2- Micronutrients (DTPA extract)			
Zn		1.00	1.30
Mn		7.50	8.90
Fe		8.70	11.00

Faba bean, Giza 2 cultivar, was planted in rows on November 22 and 26 in the 1st and 2nd seasons, respectively. The treatments were arranged in a complete randomized blocks with four replications. The plot area was 10.5m^2 (3x3.5m).

Fertilizers consisted of 15kg N/fed. as ammonium sluphate (20.6%N) and 30kg P_2O_5 /fed. as superphosphate (15%P_2O_5). N-fertilizer was added after 25 days from planting. Whereas, P-fertilization was added before planting.

Coating treatments were carried out before planting. Seeds were coated by Zn, Mn and Fe at rates of 0.3,0.15 and 0.3 g / kg seeds, respectively as follows: seeds were firstly damped with a solution of sticker substance (Triton B) and mixed well with the chelated substance of tested micronutrients. Then, coated seeds were allowed to air dried just before sowing.

At maturity(26 and 29 April for the 1st and 2nd seasons, respectively), faba bean plants were harvested and the following characters were recorded:
1- Plant height (cm) 2-Number of branches and pods/m^2

3-Number of seeds/plant. 4-Seed weight (g/plant).
5-100-seed weight (g). 6-seed, straw and biological yields(kg/fed.)

From each plot, samples of both seeds and straw were dried, ground and wet digested using H_2SO_4-$HClO_4$ acid mixture. In digested product, nitrogen was determined with micro-kjeldahl apparatus(Chapman and Pratt,1961). Phosphorus was determined colorimetrically according to Watanabe and Olsen(1965). Potassium was determined using flame photometer (Richards, 1954). Zinc, manganese and iron were determined using atomic absorption spectroscope (Chapman and Pratt, 1961).

All collected data were statistically analyzed according to Gomez and Gomez (1984).

RESULTS AND DISCUSSION

1- Effect on yield and yield attributes :

1-a-Yield attributes:

Data in Table (2) indicated that, in both growing seasons, number of branches and pods/m^2 of faba bean plants were significantly increased as the application of different treatments of micronutrients. However, there were no significant differences between the treatments in case of plant height (cm), seed weight (g)/plant and 100-seed weight(g). The maximum values of all above-mentioned parameters were attained when the application of Zn, Mn and Fe simultaneously, whilst the least increments were recorded when micronutrients application individually. Double mixtures gave intermediate values.

The enhancing effect of the investigated elements on the number of branches and pods may be attributed to changes induced by these nutrients in the endogenous hormone ratios, Szirtes et al. (1986) and Ibrahim and Shalaby (1994). Yet, the increases of both seed index (100-seed weight) and seed weight /plant may be due to that these elements enable the plants to grow well and improve transferring the photosynthetic substances from leaves to seeds during synthesis processes because of their effects on the enzymatic group. Consequently, the weight of seeds increases, Waly (1996) and Nassar (1997) on wheat. The superiority effect of Fe- treatments compared to the other individual treatments is in a agreement with that obtained by many investigators such as El-Gayar et al. (1988) on faba bean plants.

Table (2): Effect of investigated micronutrient treatments on the content of Photosynthetic pigments (mg/plant) in faba bean leaves at 70 days age.

Treatments	No. of branches /m²			No. of pods/m²			Plant height(cm)		
	1st season	2nd season	Mean	1st season	2nd season	Mean	1st season	2nd season	Mean
Control	25.0	21.1	23.1	87.3	93.2	90.3	103.9	123.6	113.8
Zn	26.9	23.8	25.4	102.0	123.7	112.9	106.8	126.5	116.7
Mn	25.0	22.9	24.0	96.5	107.5	102.0	105.5	126.4	116.0
Fe	25.0	24.1	24.6	107.0	111.0	109.0	104.7	124.0	114.4
Zn+Mn	31.3	26.9	29.1	112.0	130.4	121.2	110.3	132.3	121.3
Zn+Fe	34.4	28.2	31.3	112.9	147.2	130.1	109.5	131.7	120.6
Mn+Fe	29.7	25.4	27.6	111.0	128.7	119.9	107.0	129.7	118.4
Zn+Mn+Fe	36.2	33.0	34.6	118.0	168.3	143.2	116.9	134.8	125.9
L.S.D.at 5%	6.6	5.9	6.2	12.7	35.0	19.4	N.S	N.S	N.S
Treatments	No. of seeds/plant			Seed weight(g/plant)			100-seed weight		
	1st season	2nd season	Mean	1st season	2nd season	Mean	1st season	2nd season	Mean
Control	29.1	32.0	30.6	16.4	18.4	17.4	56.02	57.44	56.73
Zn	31.8	36.7	34.3	18.7	22.0	20.4	58.22	59.76	58.99
Mn	29.9	36.0	33.0	17.4	20.8	19.1	27.13	57.67	57.40
Fe	31.7	37.2	34.5	18.5	22.2	20.4	58.16	59.25	58.71
Zn+Mn	34.5	40.0	37.3	20.7	24.3	22.5	60.09	61.10	60.60
Zn+Fe	36.1	40.5	38.3	22.2	25.7	24.0	60.49	63.45	61.97
Mn+Fe	32.6	37.6	35.1	19.4	22.9	21.2	59.00	60.68	59.84
Zn+Mn+Fe	40.2	44.9	42.6	25.5	29.2	27.4	63.72	63.72	63.67
L.S.D.at 5%	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S

1.b. Seed and straw yields:

As for the effect of micronutrients under investigation on seed, straw and biological yield of faba bean, data presented in Table (3) indicated that all aforesaid parameters were positively affected as seed coating by different treatments but there were no significant differences between various treatments. Triple treatment (Zn+Mn+Fe) was the superior in this respect. The mean values of the two seasons revealed that the increase percent of seed yield compared to the control treatment was 58.2% for triple mixture treatment 22.2 to 38.5% in case of dual mixtures and 9.9 to 17.4% in case of individual treatments. For straw yield, the corresponding increases percent were 61.5%, between 37.3 to 52.8% and between 30.1 to 39.1% respectively.

Table (3): Effect of some micronutrients on seed, straw and biological yield (kg/fed.) of faba bean.

Treatments	Seed yield (kg/fed.)			Straw yield (kg/fed.)			Biological yield (kg/fed.)			Seed/Straw Ratio		
	1st season	2nd season	Mean	1st season	2nd season	mean	1st season	2nd season	Mean	1st season	2nd season	Mean
Control	573	643	608	632	678	655	1205	1321	1263	0.91	0.95	0.93
Zn	656	772	714	877	944	911	1533	1716	1625	0.75	0.82	0.79
Mn	608	728	668	808	895	852	1416	1623	1520	0.75	0.81	0.78
Fe	648	778	713	855	943	899	1503	1721	1612	0.76	0.83	0.79
Zn+Mn	727	853	790	902	976	939	1629	1829	1729	0.81	0.87	0.84
Zn+Fe	780	903	842	983	1019	1001	1763	1922	1843	0.79	0.89	0.84
Mn+Fe	681	804	742	874	923	899	1555	1727	1641	0.78	0.87	0.83
Zn+Mn+Fe	896	1027	962	1019	1097	1058	1915	2124	2020	0.88	0.94	0.91
L.S.D.at 5%	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S			

The promoting effects of micronutrients under investigation on both seed and straw yields can be explained through the following reactions:

1- As seed yield is a function of number of pods/m^2, seed yield/plant and 100-seed weight. Since, these parameters are positively affected by micronutrients addition (Table, 2). Hence, yield is also increased. Likewise, straw yield is a product of plant height and number of branches / m^2. So, straw yield increased as a result of increasing these measurements (Table, 2).

2- Zn,Mn and Fe involved directly or indirectly in starch, protein and other biological components formation in faba bean seeds through their functions in the respiratory and photosynthesis mechanisms as well as its roles in the activity of various enzymes(Monged et al., 1993).

3- The previous micronutrients have important roles in stimulating the vegetative growth through increasing the cell size, leaf area. Thus, the rate of photosynthesis increase(Mahmoud et al, 1987).

4- The aforementioned trace elements delay the senescence of plants through raising the level of IAA, chlorophyll content and native assimilation ratio (NAR) in leaves. Thus, total dry matter accumulation and yield components increase(Kumar et al., 1988).

Since the biological yield is the summation of seed and straw yields. Hence, it can be concluded that it increases as a result of increasing the above mentioned two fractions (Table, 3).

The highest values of seed, straw and biological yields recorded with the triple treatment (Zn+Mn+Fe) may be due to that the addition of these nutrients together achieves the suitable balance among them. This enable the plants to grow well. As a result, yield components increase.

When the seed to straw ratio in both seasons was considered, the differences between the treatments were pronounced as shown in Table (3). This can be explained on the basis of the role of micronutrients under study in both the vegetative and reproductive stages. In this connection, Badr et al (1996) reported that the role of specific micronutrients in prolonging the

vegetative stage was accompanied by a competition between vegetative and reproductive growth.

2- Effect on macronutrients content:

Data presented in Table (4) show that for the two seasons, N, protein, P and K contents in both faba bean seeds and straw significantly increased as the addition of Zn, Mn and Fe, individually or in double and triple combinations.

Table (4):Effect of investigated micronutrients treatments on macronutrients content (kg/fed.) in faba bean seeds and straw.

Treatments	N						Protein in seeds		
	Seeds			Straw					
	1st season	2nd season	Mean	1st season	2nd season	Mean	1st season	2nd season	Mean
Control	15.1	19.7	17.4	3.2	3.1	3.15	94	123	109
Zn	22.7	26.8	24.8	5.1	5.3	5.2	142	168	155
Mn	18.0	24.5	21.3	4.4	4.4	4.4	113	153	133
Fe	24.0	27.1	25.6	5.1	5.4	5.3	150	169	160
Zn+Mn	28.5	31.4	30.0	6.0	6.7	6.4	178	196	187
Zn+Fe	31.0	33.8	32.4	7.0	7.3	7.2	194	211	203
Mn+Fe	26.1	29.0	27.6	5.5	5.9	5.7	163	181	172
Zn+Mn+Fe	37.0	40.2	38.6	7.8	8.4	8.1	231	251	241
L.S.D.at 5%	6.6	10.6	5.47	0.7	0.7	0.6	34.9	66	34.2

Table 4:(continous.)

Treatments	P						K					
	Seeds			Straw			Seeds			Straw		
	1st season	2nd season	Mean	1st season	2nd season	Mean	1st season	2nd season	Mean	1st season	2nd season	Mean
Control	2.02	2.75	2.39	0.28	0.44	0.36	5.70	6.00	5.85	7.70	8.40	8.10
Zn	2.94	3.55	3.25	0.47	0.76	0.62	6.70	7.42	7.06	12.40	11.90	12.20
Mn	2.38	3.33	2.86	0.41	0.68	0.55	6.22	6.93	6.58	10.90	11.00	11.00
Fe	2.71	3.65	3.18	0.49	0.90	0.70	6.81	7.64	7.22	12.60	11.90	12.30
Zn+Mn	3.26	4.04	3.65	0.65	1.03	0.84	7.87	8.70	8.29	14.10	13.20	13.70
Zn+Fe	3.56	4.40	3.98	0.79	1.35	1.07	8.50	9.49	9.00	15.80	14.60	15.20
Mn+Fe	2.87	3.77	3.32	0.57	0.91	0.74	7.30	8.21	7.76	13.00	12.40	12.70
Zn+Mn+Fe	4.17	5.30	4.74	0.96	1.91	1.44	10.80	11.00	10.90	18.60	17.20	17.90
L.S.D.at 5%	0.65	1.40	0.70	0.08	0.10	0.07	1.54	2.89	1.49	2.89	1.56	1.21

The synergistic effects of the foregoing elements on the macronutrients content can be attributed to the following reasons:

1- Increasing the corresponding values of seed and straw yields, Table (3).
2- These elements have important roles in assimilation processes e.g. proteins and nucleic acids synthesis, Delvin and Withman (1983). Yet, they are considered essential components of various enzymes necessary for metabolic mechanisms, Vallee and Wacker (1973).
3- Trace elements under investigation incorporate with assimilation processes of organic and inorganic phosphorus compounds (phospholipids, phosphoproteins and phosphocarbohydrates).

Among the individual treatments, Fe and Zn surpassed Mn. whereas, in case of dual additions, the treatment of (Zn+Fe) gave the greatest value followed by the treatments of (Zn+Mn) and (Mn+Fe), respectively.

The statistical analysis indicate that in most cases, there were no significant differences between the individual treatments when compared with each others or between the dual treatments but there were significant differences between the dual and individual treatments and between the triple treatment and the other ones. In this respect, Waly(1996) on pea and Nassar(1997) on wheat found that the addition of micronutrients simultaneously give additional enhancing effect in NPK contents compared with the individual applications. Moreover, the superiority effect of the triple treatment may be due to the suitable blance between the aforesaid micronutrients which enable the plants to grow well and absorb more quantities of NPK.

4- Effect on micronutrients content :

Data indicated in Table (5) revealed that for the two seasons all investigated micronutrient treatments increased the contents of Zn, Mn and Fe in both faba bean seed and straw compared with the control treatment.

Mean values of two season showed that the highest increments in Zn, Mn and Fe contents in seed and straw were attained when seed coating with the triple mixture of the aforementioned micronutrients i.e.(Zn+Mn+Fe). In addition, application of any element individually significantly increased its content in faba bean seeds and straw and also promoted the content of other micronutrients in both the aforementioned two fractions. Also, there were significant differences between the dual treatments included the element and the other individual ones.

It is also evident from Table (5) that the effects of treatments under investigation on micronutrients content was more pronounced in straw than in seeds.

The above-mentioned results can be explained on the basis of raising the corresponding values of both seed and straw yields. Yet, faba bean seed coating with Zn, Mn and Fe promote the proliferation of roots through the soil and lead the plants to grow well. Consequently, plant roots absorb more nutrients and correct the suitable requirements of Zn, Mn and Fe. These results are in hormony with those obtained by Osman et al.(1991) on faba bean and Hassan (1996) and Nassar (1997) on wheat. In addition, Osman et al. (1991) indicated that more than 95% of Zn required by faba bean plant is supplied by diffusion. They also reported that functions of iron in plants are affected by supply of Zn.

Finally, it worthy to notice that faba bean seed and straw yields were significantly correlated with the values of Zn, Mn and Fe contents in both the above two fractions, under different treatments of micronutrients, Fig. (1). The correlation coefficients between seed yield and Zn, Mn and Fe contents were 0.99, 0.94 and .098, respectively. For straw yield, the corresponding

correlation coefficients were 0.92, 0.88 and 0.96. The simple regression equations were as follows:

$Y_1 = -73 + 0.17X_1$ $Y_2 = -60 + 0.11X_1$

$= -13 + 0.04X_2$ $= -35 + 0.08X_2$

$= -341 + 0.73X_3$ $= -517 + 1.25X_3$

Where, Y_1 and Y_2 indicate the mean values of seed and straw yields, respectively in (kg/fed.).

Fig1

X_1, X_2 and X_3 indicate the mean values of Zn, Mn and Fe content, respectively in (mg/fed.).

The multiple regression equations were as follows:

$Y_1 = 429.4 + 2.9X_1^{**} + 3.3X_2 + 0.47X_3$ (r^2 =0.98)

$Y_2 = 472.6 + 1.8X_1^{**} + 1.0X_1 + 0.52X_3$ (r^2 =0.93)

Table (5): Effect of investigated micronutrients treatments on micronutrients content (g/fed.) in faba bean seeds and straw.

Treatments	Zn					
	Seeds			Straw		
	1st season	2nd season	Mean	1st season	2nd season	Mean
Control	32.6	38.1	35.4	16.8	24.0	20.4
Zn	41.4	62.5	52.0	32.5	48.7	40.6
Mn	35.3	45.9	40.6	23.1	33.8	28.5
Fe	37.7	58.6	48.2	28.4	41.0	34.7
Zn+Mn	47.4	74.2	60.8	36.6	57.6	47.1
Zn+Fe	55.9	79.5	67.7	48.1	62.5	55.3
Mn+Fe	40.4	62.5	51.5	29.8	42.3	36.1
Zn+Mn+Fe	90.7	102.7	96.7	56.2	73.6	64.9
L.S.D.at 5%	9.87	26.8	14.9	4.34	5.31	3.32

Table 5:(continous.)

Treatments	Mn						Fe					
	Seeds			Straw			Seeds			Straw		
	1st season	2nd season	Mean	1st season	2nd season	Mean	1st season	2nd season	Mean	1st season	2nd season	Mean
Control	11.5	14.0	12.8	18.5	26.2	22.4	89	130	110	288	392	340
Zn	14.7	18.2	16.5	33.7	38.9	36.3	146	197	172	445	680	563
Mn	15.5	18.7	17.1	35.3	39.0	37.2	105	158	132	383	620	502
Fe	13.7	18.2	16.0	32.1	38.3	35.2	160	234	197	480	782	631
Zn+Mn	21.0	23.1	22.1	44.1	53.8	49.0	167	243	205	462	765	614
Zn+Fe	18.6	22.0	20.3	40.4	43.2	41.8	254	280	267	593	893	743
Mn+Fe	19.3	21.8	20.6	42.2	44.6	43.4	188	250	219	502	781	642
Zn+Mn+Fe	28.8	29.5	29.2	52.4	70.8	61.6	308	433	371	718	1005	862
L.S.D.at 5%	3.48	7.70	3.88	5.16	5.67	4.16	81	42.2	44.5	59.5	95.6	54.8

From the foregoing results, it can be concluded that seed coating with micronutrients had a positive effect on the quantity and quality of faba bean yield. In this connection, triple application i.e. (Zn +Mn +Fe) attained the highest values of faba bean yield and yield components as well as and macro-and micronutrient contents followed by dual and individual treatments, respectively. This reveals that application of micronutrients under investigation simultaneously give additional positive effects on all above-mentioned parameters. Yet, the greatest response of faba bean plants to the triple treatment means that the amounts of Zn, Mn and Fe in the soil under study are not sufficient to face the requirements of faba bean plants from these nutrients.

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تأثير تغليف البذور ببعض العناصر الصغرى على الفول البلدي
2- التأثير على المحصول ومكوناته ومحتواه من العناصر الغذائية.

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أقيمت تجربتان حقليتان في محطة البحوث الزراعية بالجميزة خلال موسمي الزراعة 1999/1998 ، 2000/1999 بغرض دراسة تأثير تغليف بذور الفول البلدي بالزنك والمنجنيز والحديد على محصولي الحبوب والقش ومحتواهما من العناصر الغذائية الكبرى والصغرى وكذلك محتوى البذور من البروتين.

غلفت بذور الفول البلدي (صنف جيزة 2) قبل الزراعة بعناصر الزنك والمنجنيز والحديد في صورتها المخلبية (بمعدل 0.3 جم عنصر/ كجم بذره) وذلك في صورتها المنفردة أو في صورة مخاليط ثنائية أو ثلاثية.

وقد أشارت النتائج المتوسطة احصائيا لكلا موسمي النمو والمتحصل عليها إلى النقاط الآتية :

1- أدت إضافة العناصر الصغرى موضوع الدراسة- منفردة أو في صورة مخاليط إلى زيادة مكونات محصول الفول البلدي (عدد الفروع والقرون/م^2 – ارتفاع النبات – عدد ووزن البذور/نبات – وزن المائة بذره) وكذلك زيادة محصول البذور والقش والمحصول البيولوجي/ فدان. وقد تحققت أقصى الاستجابات لجميع المقاييس السابقة مع المعاملة الثلاثية للعناصر الصغرى (زنك+المنجنيز+الحديد) تلتها المعاملات الثنائية ثم المعاملات الفردية.

2- بمقارنة معاملات العناصر الصغرى ببعضها فقد لوحظ تفوق معاملتي (الزنك+الحديد)، (الزنك+المنجنيز) على معاملة (المنجنيز+الحديد) وذلك في حالة مخاليط العناصر الصغرى الثنائية بينما لوحظ ارتفاع القيم المتحصل عليها لجميع المقاييس المحصولية السابقة عند إضافة الحديد والزنك عنة عند إضافة المنجنيز (عند مقارنة المعاملات المنفردة للعناصر الصغرى ببعضها)

3- أدى تغليف بذور الفول البلدي بمعاملات العناصر الصغرى إلى الزيادة المعنوية في محتوى البذور والقش من النتروجين والفوسفور والبوتاسيوم وكذلك محتوى البذور من البروتين وقد سجلت أعلى القيم عند تغليف البذور بالعناصر الثلاث مجتمعة تلاها تغليف البذور بمخاليط العناصر الثنائية ثم بالعناصر منفردة.

4- حققت إضافة العناصر الصغرى المدروسة زيادة معنوية في محتواها في كل من البذور والقش كما شجعت إضافتها من امتصاص غيرها من العناصر الصغرى وزيادة محتواها في كلا المكونين السابقين. وفى هذا الصدد تفوقت معاملات العناصر الصغرى الثلاثية والثنائية على التوالي على غيرها من المعاملات الفردية.

5- ارتبط محصولي البذور والقش معنويا بمحتواهما من الزنك والمنجنيز والحديد. وقد بينت ذلك معادلات الانحدار المركبة الآتية:-

محصول البذور = 429.4+ 2.9زنك** + 3.3 منجنيز + 0.47 حديد (معامل الارتباط = 0.98)

محصول القش = 472.6+ 1.8 زنك** + 1.0 منجنيز + 0.52 حديد (معامل الارتباط = 0.93)