Response of Faba Bean to Foliar Spraying with Humic Substances and Micronutrients

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ABSTRACT

The objective of this study was to investigate the effect of humic substances, some micronutrients and their combination as foliar spraying on faba bean yield and seeds quality. Two field trials were carried out at Sakha Agric. Research Station Farm, Kafr El-Sheikh Governorate, Egypt, during two successive seasons of 2007/2008 and 2008/2009 using faba bean variety Sakha 2. Split plot design was used with four replicates. The main plots were assigned with two humic substances treatments (i) without humic substances spraying, and (ii) spraying with humic substances at the rate of 300 mg L^{-1} of spraying solution in the suitable volume for the plant ages. The sub-plots were assigned with five treatments of (1) without spraying (check treatment), (2) spraying with copper at the rate of 100 mg Cu L^{-1} of spraying solution as copper sulphate, (3) spraying with zinc at the rate of 200 mg Zn L^{-1} of spraying solution as zinc sulphate, (4) spraying with iron at the rate of 300 mg Fe L^{-1} of spraying solution as ferrous sulphate, and (5) spraying with solution containing 100, 200 and 300 mg L^{-1} of Cu, Zn and Fe. The obtained results can be summarized as:

Spraying with micronutrients significantly increased faba bean seeds yield in both seasons. Spraying with Fe produced the highest seeds yield of 3753.9 and 3772.0 kg ha^{-1} in the first and second seasons, respectively and increased 100 seeds weight, N% and P% in the seeds, N content kg ha^{-1}, protein % in the seeds and available P in the soil after the harvesting. Spraying with Cu increased the biological yield in both seasons. Humic substances high significantly increased the seed yield by 20.8 and 22.9% in the first and second seasons, respectively, increased the biological yield in both seasons, 100 seeds weight, N%, P%, N content, protein % in the seeds, available N and available P in the soil after the harvesting. Humic substances increased the stimulating effects of micronutrients on all the studied parameters.

INTRODUCTION

Legumes like faba bean and clover are sowing in rotation with gramines crops like rice and maize to improve soil properties and fertility.

Faba bean is one of the most important legumes in Mediterranean Agricultural area. In Egypt it consumed in huge quantities as human food and their livestock feed because it is a cheap plant protein source. The dry seeds of faba bean contain about 30% protein and 65% carbohydrates as main components (Omer *et al.,* 1990).

Micronutrients are essentially for faba bean growth and increasing its productivity. Copper is known to be associated with a number of metaloproteins. The essential metabolic role of copper is evident from its presence in cytochromoxidase. Copper was observed to be necessary for faba bean nodulation (Hamissa *et al.*, 2000). El-Fiki *et al.* (2008) found that grains, straw and biological yields were positively affected by the application of iron and zinc in both non chelated or chelated forms. Building of the High Dam and increasing purity of the macronutrients fertilizers decreased the micronutrients applied naturally to the soils. Low organic matter content, high pH and calcium carbonate lead to low micronutrients availability to plants. Under such conditions, soil application of micronutrients can be very expensive. Foliar application of micronutrients generally is more effective, less costly and accepted practice for many crops. In this respect, spraying of micronutrients to plants grown on some soils of Egypt gave better growth and more yield (El-Gayar *et al.,* 1988, Waly, 1996, Mourad *et al.,* 2004, El-Saady *et al*, 2007, Helmy and Shaban, 2007 and Abd El-Hameed and Sarhan, 2008).

As the universe is going now the way of clean agriculture and minimizing pollution effects, organic and biofertilizers become the best products to improve soil properties and productivity. They are considered as the most important factor in reducing the application of the inorganic fertilizers, consequently, reduce the adverse environmental impact of chemicals (Marschner, 1995). Humic substances are the most abundant organic constituents present in soil and aquatic environments those result from a humification process that involves microbial and chemical transformation of organic debris (Das and Ram, 2006). Stimulatory effects of humic substances on plant growth have been observed. A number of studies attributed a hormone-like activity to the humic substances (Cesco *et al.,* 2000 and 2002). Humic substances can inhibit root surface enzymes which increase plant growth (Fred and Weil, 2004), and stimulate nutrients uptake (Ahmad *et al.,* 1996, El-Ghozoli, 1998, Bama and Selvakumari, 2001, Taha *et al.,* 2006 and Selim *et al.,* 2009).

The present study aimed to investigate the response of faba bean to the humic substances and micronutrients (Fe or Zn or Cu) and their combination spraying.

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MATERIALS AND METHODS

Two field trials were conducted at Sakha Agricultural Research Station Farm, Kafr El-Sheikh Governorate, Egypt during the two successive winter seasons of 2007/2008 and 2008/2009 on faba bean crop (*Vicia faba*). The used variety (Sakha 2) was planted 14 and 16 of November in the first and second seasons on ridges to assess the effects of humic substances and some essential micronutrients on faba bean yield, yield components and seeds quality as well as availability of some macronutrients in the soil after harvesting. Split plots design was used with four replicates. The main plots were assigned with two humic substances treatments of (i) without humic substances spraying and (ii) spraying with humic substances (extracted and separated by Soil Fertility and Plant Nutrition Department, Soils, Water and Environment Institute, Sakha Agric. Res. Station) at the rate of 300 mg L^{-1} of spraying solution. The sub-plots were assigned with five treatments of (1) without spraying (check treatment), (2) spraying with copper at the rate of 100 mg Cu L^{-1} of spraying solution as copper sulphate, (3) spraying with zinc at the rate of 200 mg Zn L^{-1} of spraying solution as zinc sulphate, (4) spraying with iron at the rate of 300 mg Fe L^{-1} of spraying solution as ferrous sulphate, and (5) spraying with solution containing 100, 200 and 300 mg L^{-1} of Cu, Zn and Fe, respectively. All the agricultural practices and fertilization were done as recommended for faba bean. At harvesting, yield was recorded. The plant samples were oven dried at 70^{o}C for 48 hr., finely ground by mill and wet digested using sulphoric perchloric acids mixture according to Chapman and Pratt (1961). Nitrogen was determined by microkjeldahel method, phosphorus was determined using hydroqunon colorimetric method and potassium was determined by flamephotometer method according to Jackson (1958). Protein % was calculated by multiplying N% by 6.25 according to Davidson (1922). Soil samples were collected before planting to determination of some physical and chemical soil characteristics according to Black *et al.* (1965). Some physical and chemical properties are present in Table 1. Available nitrogen was determined in the soil by extracting with 2 N KCl and determined by the microkejeldahl method, and phosphorus was extracted using 0.5 N sodium bicarbonate (pH 8.5) and determined colorimetrically using the ascorbic acid method according to Black *et al.* (1965). Available-K was extracted by ammonium acetate (1N) and determined by flamephotometer according to Jackson (1958). The obtained data was statistically analysed according to Gomez and Gomez (1982).

RERSULTS AND DISCUSSION

Table 2 showed that the used micronutrients significantly affected faba bean seed yield. The highest yields of 3753.9 and 3772.0 kg ha^{-1} were obtained with Fe-spraying in the first and second seasons, respectively. Copper spraying led to seed yield decrease by 3.6% compared to the control of spraying in the first season, on the other hand it increased the yield by 5.3% in the second season. Zinc increased the seed yield by 11.5 and 14.1% in the first and second seasons, respectively compared to the control of spraying. The combined (Cu + Zn + Fe) treatment increased the seed yield in both seasons, but the increases were less than that of Zn or Fe alone in both seasons. The increases in seed yield due to spraying of the micronutrients may be related to increasing the rates of photochemical reactions and activities of the carboxylation enzymes as well as carbonic anhydrase. Similar results were obtained by Nassar *et al.* (2002), El-Saady *et al.* (2007) and El-Fiki *et al.* (2008).

In respect to humic substances effects on faba bean seed yield (Table2) the results revealed that humic substances significantly increased seeds yield in both seasons. Humic substances alone increased the seeds yield by 20.8 and 22.9% in the first and second seasons, respectively. Humic substances increased the stimulating effects of Cu and Fe and their combination. While it negatively affected the role of zinc in both seasons. Many investigators reported the role of humic substances in increasing the stimulating effects of the micronutrients (Stevenson, 1994; Bama and Selvakuman 2001 and Selim *et al.*, 2009.

Table 1.Some physical and chemical properties of the experimental soils before planting

Season	Mechanical analysis			Texture	pH*	ECe** dSm^{-1}	Organic matter %	Available nutrients mg kg^{-1}		
	Sand, %	Silt, %	Clay, %					N	P	K
2007/2008	18.8	23.52	57.68	Clayey	7.9	2.7	1.5	22.4	13.5	380
2008/2009	18.7	23.30	58.00	Clayey	7.9	2.8	1.6	18.7	10.7	350

*pH in 1: 2.5 soil: water suspension
**ECe in the soil paste extract.

Table 2. Seeds yield (kg ha^{-1}) as affected by humic substances (H.S.) and micronutrients spraying

Treatments	1st season		Δ%		2nd season		Δ%	
	Humic substances		Elem.	Elem. + H.S.	Humic substances		Elem.	Elem. + H.S.
	Without	With			Without	With		
Without	3231.2	4083.5	-	20.8	3213.6	4170.0	-	22.9
Cu	3116.9	3552.6	-3.6	9.0	3395.4	3714.0	5.3	13.4
Zn	3654.6	3540.9	11.5	8.7	3744.6	3545.4	14.1	9.3
Fe	3753.9	3814.8	13.9	15.3	3772.0	3818.4	14.8	15.8
Cu Zn Fe	3458.6	3552.5	6.5	9.0	3498.0	3777.6	8.1	14.9
Means	3443.0	3684.9	7.0	12.5	3524.8	3804.9	10.5	15.2

$$\Delta\% = \frac{\text{Value of the treatment - value of the control}}{\text{Value of the treamtent}} \times 100$$

F test		1st season	2nd season
H.S.		**	**
Elem.		**	**
LSD	0.05	149.01	116.18
	0.01	201.94	157.46

Table 3 showed that, spraying faba bean plants with Cu or Zn or Fe or Cu + Zn + Fe significantly increased the biological yield in the first season and the increases were highly significant in the second season. The treatment of Cu + Zn + Fe had the superior effect on the biological yield in the first season. While, the superior effect was related to Zn spraying in the second season. Spraying with Fe had the same effect in both seasons. Since it increased the biological yield by 12.8 and 12.7% in the first and second seasons, respectively. The increases in the biological yield due to micronutrients spraying may be related to their association with a number of metaloproteins, presence in cytochrom oxidase and its required for proper development and differentiation of tissues. Close results obtained by Abd El-Hameed and Sarhan (2008) and Mourad *et al.* (2004) who indicated that the foliar application of Fe, Zn and Mn on faba bean individually or in double or triple combination increased yield and its components.

Humic substances spraying individually or combined with the used micronutrients significantly increased faba bean biological yield in the first season. In the second season the increases were highly significant.

Table 3. Biological yield (ton ha^{-1}) as affected by humic substances (H.S.) and some micronutrients spraying

Treatments	1st season		Δ%		2nd season		Δ%	
	Humic substances		Elem.	Elem. + H.S.	Humic substances		Elem.	Elem. + H.S.
	Without	With			Without	With		
Without	10.73	13.86	-	22.5	10.84	14.54	-	25.4
Cu	12.19	12.15	11.9	11.6	12.05	12.00	10.0	9.6
Zn	11.71	12.54	8.3	14.4	12.95	12.35	16.2	12.2
Fe	12.31	13.27	12.8	19.1	12.43	13.16	12.7	17.6
Cu Zn Fe	12.38	13.77	13.3	22.0	11.83	13.81	8.3	21.5
Means	11.86	12.88	11.5	17.9	12.02	13.16	11.8	17.2

F test		1st season	2nd season
H.S.		*	**
Elem.		*	**
LSD	0.05	0.64	0.53
	0.01	0.87	0.72

Humic substances individually increased the biological yield by 22.5 and 25.4% in the first and second seasons, respectively. This may be due to humic substances have a hormone-like activity. Cesco *et al.* (2000) and (2002) reported that number of studies attributed a hormone-like activity to the humic substances.

In respect to the role of humic substances combined with Cu or Zn or Fe or Cu + Zn + Fe on the biological yield. Humic substances positively affected micronutrients in both season. Wang *et al.* (1995) reported that addition of humic substances to the soil combined with P-fertilizer increased significantly the amount of water soluble phosphate and increased P uptake and yield by 25%. Taha *et al.* (2006) reported close results.

Table 4 showed that there were non significant increases in the 100 seeds weight due to micronutrients spraying in both seasons. The highest increase was noticed with spraying with Fe in the two seasons. Humic

substances individually or combined with micronutrients led to non significant increase in the 100 seeds weight in the two seasons. However, there were marked but not significant increase of the 100 seeds weight from 86.12 (g) to 90.34 (g) with an average of 4.23 (g) in the first season. While, the increase of the means in the second season were from 85.65 (g) to 89.05 (g) with an average of 3.4 (g). In general the effects of the humic substances and/or the micronutrients spraying on faba bean yield were attributed to the number of pods per plant and the number of filled seeds per pod rather than the weight of seeds. These results agree with those reported by Rauthan and Shnitzer (1981) who reported that stimulatory effects of humic substances on plant growth have been observed. Beneficial effects of humic substances on plant growth are usually exhibited by easily measurable parameters such as chlorophyll concentration, shoot and root fresh and dry weight and the number of flower buds.

Table 5 showed that spraying the faba bean with micronutrients led to marked increases of the nitrogen percentage compared to the check treatment in both seasons. The highest nitrogen percentage of 3.81 and 3.78% in the first and second seasons, respectively were obtained with the spraying with Fe treatment.

Humic substances alone or combined with the micronutrients led to increase the nitrogen % compared to the control. Where spraying with humic substances increased N% from 3.35% to 3.50% in the first season and in the second season the increase was from 3.37 to 3.67%. Combination between the micronutrients and humic substances increased the N% compared to the micronutrients without humic substances in both seasons.

In respect to phosphorus percentage in faba bean seeds (Table 5), spraying with micronutrients led to increase P% in the two seasons. The highest values of 0.48 and 0.50% in the first and second seasons, respectively were obtained with spraying with Fe, while, the lowest values of 0.42 and 0.41% were recorded with the check treatment. Humic substances increased P% in faba bean seeds. The combination between the humic substances and the micronutrients led to increase P% compared to the values of micronutrients without humic substances. This may be due to the humic substances helps in stimulating the plant growth and nutrients uptake. Similar results were reported by Fred and Weil (2004) who reported that humic substances can inhibit root surface enzymes such as invertase. The particular location of this enzyme facilitates a direct effect of the type and concentration of ions taken up by the roots on the enzyme-humics interaction (Ahmad *et al.*, 1996; Nassar *et al.*, 2002 and Taha *et al.*, 2006).

Table 4. 100 seeds weight (g) as affected by humic substances and micronutrients spraying

Treatments	1st season			2nd season		
	Humic substances		Diff.	Humic substances		Diff.
	Without	With		Without	With	
Without	84.97	89.35	4.38	81.50	86.00	4.50
Cu	85.80	89.78	3.98	82.00	84.75	2.75
Zn	86.80	93.85	7.05	83.50	87.25	3.75
Fe	91.63	93.38	1.75	93.50	95.25	1.75
Cu Zn Fe	81.38	85.38	4.00	87.75	92.00	4.25
Means	**86.12**	**90.34**	**4.23**	**85.65**	**89.05**	**3.40**
F test						
Elem.			N.S		N.S	
H.S.			N.S		N.S	

Table 5. Nitrogen and phosphorus percentage of the seeds as affected by humic substances and micronutrients spraying

Treatments	N%				P%			
	1st season		2nd season		1st season		2nd season	
	Humic substances		Humic substances		Humic substances		Humic substances	
	Without	With	Without	With	Without	With	Without	With
Without	3.35	3.50	3.37	3.67	0.42	0.44	0.41	0.41
Cu	3.61	3.76	3.55	3.76	0.45	0.45	0.41	0.44
Zn	3.62	3.76	3.71	3.91	0.45	0.48	0.48	0.51
Fe	3.81	3.71	3.78	3.81	0.48	0.48	0.50	0.49
Cu Zn Fe	3.45	3.86	3.38	3.97	0.43	0.49	0.42	0.44
Means	3.57	3.72	3.56	3.82	0.45	0.47	0.44	0.46
F test								
H.S.	N.S		N.S		N.S		N.S	
Elem.	N.S		N.S		N.S		N.S	
L.S.D. 0.05	-		-		-		-	
0.01	-		-		-		-	

Table 6 showed that, nitrogen content of faba bean seeds significantly affected by micronutrients spraying in both seasons. The highest N contents (134.76 and 141.82 kg ha^{-1}) were obtained with the spraying by Fe in the first and second seasons, respectively followed by zinc spraying (132.55 and 138.70 kg ha^{-1}). On the other hand, the lowest N contents (111.17 and 108.12 kg ha^{-1}) were recorded with non spraying treatment in the first and second, seasons.

Humic substances individually or combined with micronutrients significantly increased N content in faba bean seeds in the two seasons. The highest values (142.75 and 152.98 kg ha^{-1}) were obtained with humic substances spraying alone in the first and second seasons, respectively, followed by 137.90 and 149.69 kg ha^{-1} with the combined between humic substances and (Fe + Zn + Cu) treatment. In respect to P content kg ha^{-1} in faba bean seeds, no significant effects of micronutrients or/and humic substances spraying was detected in the first season. In the second season their were a significant effects due to micronutrients and humic substances spraying. Micronutrients without humic treatments, Fe led to the highest P content (18.43 kg ha^{-1}), while, the lowest (13.08 kg ha^{-1}) was detected with the treatment without any spraying. Humic substances individually or combined with micronutrients significantly increased P content in the seeds. The highest value of 18.50 kg ha^{-1} was obtained with combined between humic substances and Fe, followed by the values of 18.22 and 17.14 kg ha^{-1} which obtained with the combined between humic substances and zinc, and the humic substances individually, respectively. Similar results were reported by Bama and Slevakuman (2001), Nassar *et al.* (2002) who reported that application of Fe, Zn, Mn and their interactions caused an increase in N, P, K and some micronutrients uptake in seeds and straw of broad bean. Selim *et al.* (2009) obtained similar results.

Table 6 showed that spraying with micronutrients increased the protein % in both seasons. The highest values of 23.863 and 23.61% in the first and second seasons, respectively were obtained with spraying with Fe treatment. Humic substances combined with micronutrients led to increase protein % in both seasons compared to the control (without spraying). The highest values of 24.15% and 24.78 were obtained with the combined between humic substances and (Cu + Zn + Fe) treatment in the first and second seasons, respectively. Bama and Slevakuman (2001) who found that application of 10 kg humic substances ha^{-1} as potassium humate along with 75% of recommended dose of nitrogen fertilizer increased crude protein content and mineral nutrition of amaranths

Table 7 showed that micronutrients spraying led to increase available nitrogen in the soil after harvesting in both seasons. The highest values (29.75 and 35.75 mg kg^{-1}) were obtained with spraying by Zn in the first and second seasons, respectively. In respect to the effects of humic substances results indicate that humic substances individually or in combined with micronutrients led to increased the available nitrogen in the soil in the two seasons. The highest values (33.25 and 36.0 mg kg^{-1}) were obtained with spraying with the combined between Fe and humic substances in the first and second seasons, respectively.

Table 6. Nitrogen content, phosphorus content (kg ha^{-1}) and protein % in the seeds as affected by humic substances and some micronutrients spraying

H.S	Elem. treat.	N content		P content		Protein %	
		1st season	2nd season	1st season	2nd season	1st season	2nd season
Without	**Without**	111.17	108.12	13.42	13.08	21.58	21.04
	Cu	112.58	120.60	14.21	13.82	22.55	22.21
	Zn	132.55	138.70	17.02	17.93	22.63	23.18
	Fe	134.76	141.82	17.02	18.43	23.83	23.61
	Cu Zn Fe	115.51	118.20	15.14	14.47	20.94	21.13
Means		**121.32**	**128.74**	**15.36**	**15.55**	**22.31**	**22.23**
With	**Without**	142.75	152.98	15.48	17.14	21.89	22.96
	Cu	133.92	139.66	15.17	15.55	23.49	23.49
	Zn	110.40	141.34	14.04	18.22	23.49	23.46
	Fe	118.87	145.44	15.24	18.50	23.87	23.82
	Cu Zn Fe	137.90	149.69	13.92	16.54	24.15	24.78
Means		**128.74**	**145.82**	**14.76**	**17.18**	**23.24**	**23.90**
F test							
H.S.			**	**	N.S		*
Elem.			*	*	N.S		*
LSD	0.05		19.2	12.77	-		3.74
	0.01		26.04	17.30	-		5.09

Table 7. Available nitrogen and phosphorous (mg kg^{-1}) in the soil after harvesting as affected by humic substances and micronutrients spraying

Treatments	N mg kg^{-1}				P mg kg^{-1}			
	1st season		2nd season		1st season		2nd season	
	Humic substances				Humic substances			
	Without	With	Without	With	Without	With	Without	With
Without	22.05	28.00	24.50	29.90	21.40	31.20	20.60	34.00
Cu	28.00	31.50	30.25	32.25	23.20	25.20	26.60	28.00
Zn	29.75	31.50	35.75	35.00	23.60	29.00	24.00	27.00
Fe	29.75	33.25	31.50	36.00	26.00	31.40	26.60	30.00
Cu Zn Fe	24.75	26.25	28.00	28.00	23.00	27.00	20.40	29.40
Means	26.9	30.10	30	32.23	23.44	28.76	23.04	29.70
F test								
H.S.		**		**		*		*
Element		**		**		**		**
LSD 0.05		1.4		1.37		1.55		1.79
0.01		1.9		1.86		2.11		2.42

Table 7 showed that spraying with micronutrient led to increase the available P in the soil, the highest values (26.0 and 26.60 mg kg^{-1}) were obtained with Fe spraying in the first and second season. Humic substances increased available P in the two seasons alone or with micronutrients. It increased the total mean from 23.44 mg kg^{-1} with micronutrients only to 28.76 mg kg^{-1} with the micronutrients combined with the humic substances in the first season and from 23.04 to 29.70 mg kg^{-1} in the second season. These may be due to humic substances or/and micronutrients led to increase the root system, which increased available nutrients in the soil after the harvesting and decomposition of the roots. These results agree with those obtained by Fred and Weil (2004) and Taha *et al.* (2006) who concluded that humic substances gave the highest values of available nutrients, yield and nutrients uptake by wheat.

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الملخص العربي

استجابة الفول البلدى للرش بالمواد الدبالية والعناصر الغذائية الصغرى

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يتلخص الهدف من هذه الدراسة فى تقدير تأثير الرش بالمواد الدبالية وبعض العناصر المغذية الصغرى على محصول الفول البلدى وجودة بذوره. نفذت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بسخا- محافظة كفرالشيخ- مصر خلال الموسمين الشتويين ٢٠٠٧/٢٠٠٨م ، ٢٠٠٨/٢٠٠٩م على محصول الفول البلدى صنف سخا٢. استخدم تصميم القطع المنشقة فى أربع مكررات حيث شغلت القطع الرئيسية بمعاملتين للمواد الدبالية:

١- بدون رش.

٢- الرش بالمواد الدبالية بمعدل ٣٠٠ مليجرام للتر فى محلول الرش.

كما شغلت القطع الشقية بخمس معاملات رش بالعناصر الصغرى هى:

١- بدون رش (معاملة المقارنة).

٢- الرش بالنحاس بمعدل ١٠٠ مليجرام نحاس للتر فى محلول الرش.

٣- الرش بالزنك بمعدل ٢٠٠ مليجرام زنك للتر فى محلول الرش.

٤- الرش بالحديد بمعدل ٣٠٠ مليجرام حديد للتر فى محلول الرش.

٥- الرش بالنحاس + الزنك + الحديد معا بالمعدلات السابقة.

وكانت مصادر العناصر الصغرى هى كبريتات النحاس وكبريتات الزنك وكبريتات الحديدوز كما استخدمت كمية المياه المناسبة لعمر النبات فى الرش وتتلخص النتائج فى الأتى:

- أدى الرش بالمغذيات المستخدمة إلى زيادة عالية المعنوية فى محصول البذور فى الموسمين، حيث أعطى الرش بالحديد أعلى محصول للبذور حيث كان المحصول ٣٧٥٣,٩ و ٣٧٧٢كجم للهكتار فى الموسمين الأول والثانى على التوالى كما أدى إلى زيادة وزن المائة بذرة وتركيز النيتروجين والفوسفور كنسبة مئوية فى البذور ومحتوى البذور من النيتروجين كجم للهكتار والنسبة المئوية للبروتين فى البذور والفوسفور الميسر فى الأرض بعد الحصاد. بينما أعطى الرش بالنحاس أعلى زيادة فى وزن المحصول البيولوجى فى الموسمين.
- أدى الرش بالمواد الدبالية إلى زيادة عالية المعنوية فى محصول البذور حيث أعطى زيادة قدرها ٢٠,٨% ، ٢٢,٩% فى الموسمين الأول والثانى على التوالى. كما أدى إلى زيادة المحصول البيولوجى فى الموسمين ووزن المائة بذرة والنسبة المئوية للنيتروجين والفوسفور والبروتين فى البذور ومحتوى البذور من النيتروجين كجم للهكتار والنيتروجين والفوسفور الميسرين فى الأرض بعد الحصاد. كما أدى خلط المواد الدبالية مع العناصر الصغرى المستخدمة إلى زيادة التأثير المحفز للعناصر على كل القياسات المدروسة.