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Natural and Chemical Phosphorus Fertilizers as Affected Onion Plant Growth, Bulbs Yield and its Some Physical and Chemical Properties

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Abstract: Field experiments were conducted out during the two successive seasons of 2000/2001 and 2001/2002 at the experimental station of National Research Centre to study the influence of using rock phosphate as natural and calcium super-phosphate as chemical phosphorus fertilizer at 3 rates of application for onion plant. The important obtained results are following: Addition phosphorus as chemical source, i.e. super-phosphate for onion plant gained the vigour plant growth if compared with the natural phosphate. With increasing the rates up to 48 units of P_2O_5 per fed., the values of plant growth parameters recorded its highest peaks. The interaction treatments between 3 sources of phosphorus application with 3 rates of addition (16, 32 and 48 P_2O_5 units/fed.) had no significant effect on plant growth criterias. The obtained data showed that the application of P fertilizer in the form of super-phosphate (chemical) gained the heaviest tonnage of bulbs yield, and the highest values of bulb dimension as well as average bulb weight. - The highest tonnage of bulbs yield (10.72 and 15.72 tons/fed.) respectively for 1st and 2nd season were associated with that of plants which supplied the highest P rate i.e. 48 units of P_2O_5/fed. Total protein as well as N and P content of onion bulb tissues recorded their peaks with that plants which received phosphorus in the form of super-phosphate. On the contrary the addition of phosphorus fertilizer in the natural form gained the highest values of K, Fe, Mn and Zn. The content of total protein N, P, K, Mn, and Cu recorded a good positive correlation with the increasing phosphorus levels addition.

Keywords:

INTRODUCTION

There is no doubt that mineral fertilizers are essential in most cropping system if maximum yields are to be realized. However in long-term field experiments where mineral fertilizers have only been used, soil structure has been deteriorated and crop yield steadily decreased as reviewed by Ristimaki *et al*. (2000).

Phosphorus as an important nutritional element plays its part in regulating many physiological criteria in the plant which in turn effect the resulted total yield. The following review of literature of current knowledge about P, may reflect the interest of many workers in studying its mode of action and its role in the production of onion yield. However, one fact must be put in mind is that, the provided P to the plant or the soil depends largely on the available reservation of this element in the soil, so the negative or the positive results may be due to this quantity or sources stored in the soil.

The presence of phosphorus in the soil encourages plant growth because the phosphorus is an essential nutrient. Practically, phosphorus is a major building block of DND molecules (Pant and Reddy, 2003). In addition, Hinsinger, (2001) reported that the two forms of phosphorus in soil are organic and inorganic. Organic phosphorus is the most stable form of phosphorus in the soil. While inorganic phosphorus is stable. Therefore, inorganic phosphorus is readily absorbed and used by plant if it is not fixed. Nikolay Vassilev *et al*., (1996) reported that organic phosphorus is mineralized and immobilized by microbes' activities. Mineralization is the conversion of organic phosphorus to inorganic phosphorus, while, the immobilization of phosphorus involves the formation of organic phosphorus from inorganic phosphorus.

The aim of this subject is to do a comparison within using inorganic phosphorus (Rock phosphate as natural fertilizer) and calcium super phosphate as chemical fertilizer and study their effects on the growth, bulbs yield and it's some physical and chemical properties.

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MATERIALS AND METHODS

Two field experiments were carried out at the experimental Farm of National Research Centre at Shalakan (Kalubia Governorate), in 2000/2001 and 2001/2002 seasons, to study the response of onion plant to natural phosphorus fertilizer (rock phosphate, 22% P_2O_5 as source of P); and chemical phosphorus fertilizers (calcium super phosphate, 16% P2O5)as well as the compound within them (1:1) at the rates of 16,32 and 48 P_2O_5 units/fed. The physical and chemical properties of soil are presented in Table (1) for the two experiments.

Onion seedling cv. Giza 20 was sown within the period of 10^{th} -17 th of December 1n 2000 and 2001 respectively, at distance of 20 cm apart within the rows of 15 cm within the plants.

Table 1: Physical and chemical analysis of the experimental soils.

Physical properties	2000/2001	2001/2002
Soil texture	Clay	Clay
Clay (%)	46.33	47.07
Silt (%)	29.11	28.61
Fine send (%)	21.22	20.84
Coarse send (%)	3.11	2.65
Chemical analysis		
Available (K) (mg/100 g soil)	0.57	0.60
Available (P) (mg/100 g soil)	448	527
Total nitrogen (mg/100 g soil)	1251	1393
Cl (meq/L)	1.51	1.47
CO_3 (meq/L)	4.12	4.74
Na_2CO_3 (meq/L)	3.94	3.74
$CaCO_3$ (meq/L)	1.56	1.71
Organic matter (%)	1.86	1.84
SO_4 (ppm)	90.21	85.72
EC (mmhos/cm/25°C)	2.28	2.42
pH	7.85	7.6

Each experiment included 9 treatments which resulted from the interaction between 3 sources and 3 rates of phosphorus fertilizers.

A split-plot design with three replicates was used where; sources of phosphorus fertilizers were allocated to the main plots, while the different rates of P was randomly assigned to the sub-plot. Each sub-plot consisted of four rows, each of 5 meters in length and 3.2 m in width. The plot area was 20 m^2.

The normal cultural practices used for the onion production, i.e. irrigation and pest control were followed according to the traditional cultivation in the experimental location.

Plant growth expressed as plant length (cm), number of leaves per plant, and diameter of neck and bulb (cm), as well as the whole fresh and dry weight of onion plant and its leaves, neck and bulb as g/plant were recorded in representative samples (5 plants) which were taken randomly from every experimental plot at 110 days after planting in both investigated seasons.

At harvesting time, fresh onion yield and its components were calculated in terms of total bulbs yield in both two experimental seasons. Some physical properties of onion bulbs were recorded such as average bulb weight g., length (cm), and diameter at harvesting time.

The chemical constituents as nutritional values (N, P, K, Fe, Mn, Zn and Cu) as well as total soluble solids (T.S.S.) in bulbs tissues were estimated, where total nitrogen, phosphorus and potassium were determined according to the methods which described by Pregl (1945), Troug and Mayer (1939) and Brown and Lilleland (1946), respectively. As well as Fe, Mn, Zn and Cu concentration were determined using flame ionization atomic absorption, spectrometer of Chapman and Pratt (1978).

The obtained data were subjected to the analysis variance procedure and treatment means were compared to the L.S.D. Test according to Gomez and Gomez (1984).

RESULTS AND DISCUSSIONS

Plant Growth Characters:

Response of onion plant growth parameters (plant length, number of leaves/plant, average diameter of bulb, fresh and weight of whole plant as well as its different organs to different sources and levels of phosphorus fertilization for the two experimental seasons are shown in Tables (2and 3).

It evident that, addition phosphorus as chemical source, i.e. super-phosphate for onion plant gained the vigour plant growth if compared with the natural phosphate and/or the supplying half of the total needed phosphorus fertilizer as chemical mixed with other half of natural one. These findings are in good accordance

Table 2: Effect of different sources and rates of phosphorus fertilizer on onion plant growth characters during the experimental season of 2000/2001.

Phosphorus treatments													
Source	P units/ Fed.*	Plant length (cm)	No. of leaves / plant	Diameter ,cm.		Fresh weight, g. / plant.				Dry weight, g. / plant.			
				Bulb	Neck	Leaves	Bulb	Neck	Total	Leaves	Bulb	Neck	Total
Chemical (C)	16	48.67	8.33	4.17	1.40	43.07	102.17	31.43	176.67	6.07	22.27	3.33	31.67
	32	59.67	8.00	5.77	1.83	67.50	160.30	36.40	264.20	7.33	29.13	6.93	43.40
	48	59.33	11.00	6.27	2.00	84.43	195.67	46.00	326.10	8.27	36.77	8.37	53.40
Mean		55.89	9.11	5.40	1.74	65.00	152.71	37.94	255.66	7.22	29.39	6.21	42.82
Natural (N)	16	45.00	3.63	3.63	1.40	31.83	67.40	14.60	113.83	3.57	8.43	2.63	14.63
	32	51.00	4.63	4.63	1.60	46.97	101.40	24.50	172.83	5.17	17.50	5.90	28.57
	48	54.33	4.66	5.70	1.90	59.70	150.17	32.80	242.67	7.27	29.53	5.20	42.00
Mean		50.11	8.67	4.66	1.63	46.17	106.32	23.97	176.46	5.33	18.49	4.58	28.40
C+N (1:1)	16	44.67	3.77	3.77	1.33	42.30	75.90	19.20	123.30	4.43	11.70	2.43	18.57
	32	50.33	4.60	4.60	1.57	51.00	98.67	22.87	172.53	5.07	15.30	4.50	24.87
	48	52.67	4.46	5.00	1.73	62.50	138.37	33.13	234.00	6.00	22.13	6.27	34.40
Mean		49.22	8.22	4.46	1.54	51.93	104.31	25.07	176.61	5.17	16.38	4.40	25.94
Mean	16	46.11	3.86	3.86	1.38	34.37	81.82	21.74	137.93	4.69	14.13	2.80	21.62
	32	53.67	5.00	5.00	1.67	55.16	120.12	27.92	203.20	5.86	20.64	5.78	32.28
	48	55.44	5.40	5.66	1.88	68.88	161.40	37.31	267.59	7.18	29.48	6.61	43.27
L.S.D. at 5%	Chemical	1.30	5.40	0.29	0.10	13.96	16.18	3.47	16.72	0.69	5.55	0.98	6.11
	Natural	2.93	1.26	0.37	0.08	8.87	11.62	2.75	13.62	0.56	4.53	0.86	4.53
	Interaction	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.N.S.	

* Fed. = 4200 m²

Table 3: Effect of different sources and rates of phosphorus fertilizer on onion plant growth characters during the experimental seasons of 2001/2002.

Phosphorus treatments				Diameter, cm.		Fresh weight, g. / plant.				Dry weight, g. / plant.			
Source	P units/ Fed.*	Plant length (cm)	No. of leaves / plant	Bulb	Neck	Leaves	Bulb	Neck	Total	Leaves	Bulb	Neck	Total
Chemical (C)	16	45.67	8.00	4.13	1.41	53.37	97.70	26.50	177.57	3.16	11.50	2.37	17.03
	32	55.67	9.33	5.60	1.83	70.03	176.70	42.75	289.48	7.08	23.37	4.90	35.35
	48	63.33	11.67	6.17	2.37	74.13	196.70	46.80	317.63	8.49	35.07	6.47	50.03
Mean		54.89	9.67	5.30	1.87	65.84	157.03	38.68	261.56	6.25	23.31	4.58	34.13
Natural (N)	16	40.33	5.67	3.47	1.30	34.13	54.33	16.20	104.67	2.66	7.13	1.57	11.36
	32	52.00	7.33	4.67	1.47	54.40	117.83	25.67	197.90	5.46	24.40	2.93	32.80
	48	55.00	9.00	5.47	1.70	66.90	137.63	34.81	239.34	6.41	24.80	3.97	35.17
Mean		49.11	7.33	4.53	1.49	51.81	103.27	25.56	180.64	4.84	18.78	2.82	26.44
C+N (1:1)	16	43.00	6.33	4.20	0.90	46.23	88.93	15.60	150.77	2.72	12.90	1.73	17.35
	32	48.67	9.00	4.83	1.50	55.20	127.13	26.48	208.81	3.97	17.17	2.47	23.60
	48	53.67	8.67	4.97	1.58	65.23	154.67	36.20	256.10	4.59	37.40	3.15	45.14
Mean		48.44	8.00	4.67	1.33	55.56	123.58	26.09	205.23	3.76	22.49	2.45	28.70
Mean	16	43.00	6.67	3.93	1.20	44.58	80.32	19.43	144.33	2.85	10.51	1.89	15.25
	32	52.11	8.56	5.03	1.60	59.88	140.56	31.63	232.07	5.50	21.64	3.43	30.58
	48	57.33	9.78	5.53	1.88	68.76	163.00	39.27	271.03	6.50	32.42	4.53	43.45
L.S.D. at 5%	Chemical	1.90	0.54	0.42	0.28	4.73	5.83	2.47	5.12	1.73	2.90	0.40	3.19
	Natural	2.60	0.81	0.42	0.33	4.37	8.97	1.97	11.64	1.45	2.27	0.31	2.18
	Interaction	N.S.	N.S.	N.S.	N.S.	N.S.	15.53	N.S.	20.16	N.S.	3.933	0.54	3.78

* Fed. = 4200 m²

in the two experiments of 2000/2001 and 2001/2002 for all plant growth elements. The statistical analysis of the obtained data reveals that the differences within different 3 phosphorus sources were enough to reach the 5 % level of significant. However, the increase in fresh and dry weight of whole onion plant may be attribute to the increase in size of plant, largest leaves number, heaviest fresh and dry weight of leaves, bulb and neck. Generally, that onion plant which received its phosphorus requirements as chemical (super-phosphate) caused an increase in fresh weight of whole plant amounted by 44.9, 44.7 % (1st season), and 44.8, 27.4 % (in 2nd season) respectively, over that plant which received phosphorus fertilizer as natural and/or that which supplied chemical + natural as 1:1. This increments in dry weight of whole plant amounted by 50.1, 65.0 % in 1st season and by 29.1, and 18.9 % in 2nd season for the above mentioned respective.

Concerning to the effect of different rates of phosphorus fertilizer on the plant growth characters, the shown data of Tables (2 and 3) reveals that, with increasing the rates up to 48 units of P_2O_5 per feddan the values of plant growth parameters recorded its peak in both experimental seasons. These findings mean that, the application of the lowest phosphorus rate, the weakness onion plant growth obtained. However, the statistical analysis of the colleting data shown that, the enhancing effect of increasing phosphorus rates on plant growth properties were significantly in the two experimental seasons.

The effect of P-application on growth components could be explain through the role of phosphorus which is extremely important as a structural part of many components, notably nucleic acid, and phospholipids. In addition phosphorus an indispensable role in energy metabolism the high energy of hydrolysis of phosphate and various organic phosphate bonds being used to induce chemical reaction.

The interaction treatment between 3 sources of phosphorus application (chemical, natural and mixed) with 3 rates of addition (16, 32 and 48 P_2O_5 units/fed.) had no significant effect on plant growth criteria's. These were true in 1st and 2nd seasons, except the dry weight of whole onion plant and its bulb, and neck as well as fresh weight of whole plant and its bulb. In spite the no significant response, but the resulted data indicate that with increasing P rate, with different P source, the values of plant growth characters increased. Generally, the best plant growth was noticed with that plants which received 48 units of P_2O_5 as chemical (super-phosphate). These were similar in both experiments.

Table 4: Effect of different sources and rates of phosphorus fertilizer on bulbs onion yield and its components during the experimental seasons of 200/2001 and 2001/2002.

Phosphorus treatments		Bulb characters			Yield ton/fed.	Bulb characters			Yield ton/fed.
Sources	P Units/ Fed*.	Length, cm.	Diameter ,cm.	Average wt., gm.		Length,cm.	Diameter,cm.	Average wt.,gm.	
		1 st season				2 nd season			
Chemical (C)	16	5.20	7.23	126.33	9.227	6.65	6.96	179.87	10.60
	32	7.17	6.70	207.37	10.603	6.68	8.66	224.04	16.41
	48	7.30	6.57	257.77	11.203	7.23	9.36	252.97	17.47
Mean		6.56	6.83	197.16	10.344	6.85	8.33	218.96	16.16
Natural (N)	16	5.60	5.60	118.47	9.060	6.12	6.41	118.34	10.82
	32	6.07	6.07	190.53	9.843	6.40	7.36	207.21	15.10
	48	6.33	6.00	237.57	10.347	6.78	7.61	216.45	14.47
Mean		6.00	5.89	182.19	9.750	6.43	7.13	180.66	13.46
C+N (1:1)	16	6.00	5.63	130.93	9.130	6.42	6.19	168.54	12.57
	32	6.33	6.03	165.27	9.883	6.72	7.26	186.82	15.58
	48	6.20	6.63	259.40	10.610	7.16	7.77	223.31	15.24
Mean		6.18	6.10	185.20	9.874	6.77	7.07	192.89	14.46
Mean	16	5.60	6.16	125.27	9.139	6.40	6.52	155.58	12.66
	32	6.52	6.27	187.72	10.110	6.60	7.76	206.02	15.70
	48	6.61	6.40	251.58	10.720	7.06	8.25	230.91	15.72
L.S.D. at 5%	Chemical	0.34	0.52	N.S.	0.410	0.30	0.18	11.03	1.29
	Natural	0.25	N.S.	11.15	0.425	0.27	0.28	7.96	0.74
	Interaction	0.43	0.67	19.32	N.S.	N.S.	0.48	13.79	N.S.

* Fed. = 4200 m²

Generally, the role of phosphorus in plant growth are investigated by many workers (Nikolay *et al.*, 1996; Vacchain and Patel, 1996; Warade *et al.*, 1996; Hinsinger, 2001; Pant and Reddy, 2003 and Shafeek *et al.*, 2004). All of them agreed that, the presence of phosphorus in the soil encourages plant growth, because phosphorus is an essential nutrient.

Particularly, phosphorus is a major building block of DNA molecules. It responsible for the storage of energy in the form of ADP and ATP. The energy stored in these phosphate compounds allow for the transportation of nutrient across the cell wall and the synthesis of nucleic acid and proteins. The addition of phosphorus fertilizer ensure that crops will reach their full potential by using additional phosphorus to encourage root growth and promoting resistances to root diseases.

Onion Bulbs Yield and its Some Physical Properties:

Table (4) presents the response of onion bulbs yield as tons/fed and dimension of its bulbs to the treatments of different P sources and leaves during the two experimental seasons.

The obtained data showed that, the application of P fertilizer in the form of super-phosphate (chemical) gained the heaviest tonnage of bulbs yield (10.344 and 16.16 tons/fed. for 1st and 2nd season respectively, followed in descending order by that plants which received P as chemical and natural (1:1). It means that the lowest onion bulbs yield was associated with the addition of rock phosphorus as natural source. These findings are in good accordance in both experiments. The response of bulb dimension (length, diameter) and average bulb weight (g.) to the source of P followed the same pattern of change which mentioned above. In addition the statistical analysis of the collected data reveals that, the variation within 3 P source treatments were enough to reach the 5 % level of significance. These were true in both seasons, except the average bulb weight of 1st season.

With increasing the P dose for onion fertilization from 16 units of P_2O_5 up to 48 units/fed. the total bulbs yield recorded an enhancement. It means the heaviest tonnage of bulbs yield (10.72 and 15.72 tons/fed. respectively for 1st and 2nd season were associated with that of plants which supplied the highest P rate, i.e. 48 units of P_2O_5/fed.). The same pattern of change was followed for the response of length, diameter and average bulb weight as its responsibility to the P rates. Moreover, the 3 treatments rates of P varied significantly at 5 % level. These were similar for total bulbs yield as ton/fed., and its some physical properties in both experiments, with exception of bulb diameter in 1st season.

It could be concluded that, the phosphorus fertilizer had a major effect on the productivity of onion plant, hence increased total bulb yield and its components. It may be attributed to the enhancement of phosphorus on the plant growth and it's reflected on the bulbs yield. Many investigators had obtained a similar trend of results (Gupta, *et al.*, 1999 and Ghoname and Shafeek *et al.*, 2004).

The shown data of Table (4) demonstrate that, the interaction within different sources and levels of P fertilization had an effect on onion bulbs yield and its physical properties. However, the tonnage bulbs yield had no significant response in both seasons.

Generally, it could concluded that, in spite the no significant effect of the interaction treatments but the presented data indicates that, the heaviest onion bulbs yield and the highest values of onion bulb dimension as well as average bulb weight, all of the were correlated with that plants which received P as super-phosphate at rate of 48 units of P_2O_5/fed.

Nutritional Values:

The nutritional values of onion bulbs yield as affected by the treatments of 3 sources and 3 rates of phosphorus fertilization are reported in Table (5 and 6). Total protein as well as N and P content of onion bulb tissues recorded their peaks with that plants which received phosphorus in the form of super-phosphate. On the contrary, the addition of phosphorus fertilizer in the natural form gained the highest values of K, Fe, Mn and Zn. These findings are true in both experiments. The statistical analysis of the obtained data showed that the differences within the 3 different sources of phosphorus addition were true to reach the significant level in the two experiments.

Table 5: Effect of different sources and rates of phosphorus fertilizer on some chemical properties of onion bulb tissues during the experimental seasons of 2000/2001.

Phosphorus treatments				%			ppm			
Sources	P Units/ Fed.*	T.S.S.	Protein	N	P	K	Fe	Mn	Zn	Cu
Chemical (C)	16	11.00	17.90	2.86	0.211	2.39	2.62	23.77	31.87	11.51
	32	10.53	20.23	3.24	0.224	3.41	2.73	31.77	34.70	11.57
	48	11.00	21.88	3.50	0.237	2.93	2.70	27.30	30.53	12.63
Mean		10.84	20.00	3.20	0.224	2.91	2.68	27.61	32.37	11.90
Natural (N)	16	10.67	15.02	2.40	0.199	2.64	2.71	24.40	33.77	11.92
	32	9.63	17.75	2.84	0.217	3.54	3.39	33.23	40.37	13.04
	48	11.33	18.19	2.91	0.215	3.76	3.17	36.30	39.87	12.70
Mean		10.54	16.99	2.72	0.210	3.31	3.09	31.13	38.00	12.55
C+N (1:1)	16	12.60	14.81	2.37	0.212	2.50	2.72	24.30	35.77	11.32
	32	11.60	16.31	2.61	0.217	2.68	2.81	31.40	37.93	12.17
	48	9.67	16.21	2.59	0.214	2.92	3.19	32.83	36.07	12.98
Mean		11.29	15.78	2.52	0.214	2.70	2..91	29.51	36.59	12.16
Mean	16	11.42	15.91	2.55	0.207	2.51	2.68	24.16	33.80	11.58
	32	10.59	18.10	2.9.	0.219	3.21	2.98	32.13	37.67	12.26
	48	10.67	18.76	3.00	0.222	3.20	3.02	32.14	35.49	12.77
L.S.D. at 5%	Chemical	N.S.	0.97	0.16	N.S	0.06	0.11	2.65	N.S	N.S
	Natural	N.S.	0.91	0.15	0.005	0.15	0.13	1.95	2.68	0.33
	Interaction	N.S.	N.S	N.S	0.009	0.26	0.22	3.38	N.S	0.57

* Fed. = 4200 m²

Table 6: Effect of different sources and rates of phosphorus fertilizer on some chemical properties of onion bulb tissues during the experimental seasons 2001/2002.

Phosphorus treatments				%			ppm			
Sources	P Units/ Fed.*	T.S.S.	Protein	N	P	K	Fe	Mn	Zn	Cu
Chemical (C)	16	10.53	19.38	3.10	0.207	2.45	2.59	23.23	33.13	11.06
	32	11.67	22.13	3.54	0.238	3.47	2.58	26.47	35.70	11.62
	48	9.67	23.08	3.69	0.236	2.79	3.54	27.60	32.47	12.73
Mean		10.62	21..53	3.44	0.227	2.90	2.90	25.77	33.77	11.80
Natural (N)	16	12.17	14.96	2.39	0.200	2.52	2.64	28.93	33.83	11.96
	32	10.33	15.44	2.47	0.219	2.69	3.31	32.07	39.97	12.68
	48	10.67	15.73	2.52	0.218	3.90	3.34	35.57	44.20	12.73
Mean		11.06	15.38	2.46	0.212	3.37	3.10	32.19	39.33	12.46
C+N (1:1)	16	10.97	15.13	2.42	0.210	2.45	2.59	27.50	32.80	11.16
	32	12.67	16.73	2.68	0.219	2.45	2.81	27.90	39.47	13.26
	48	10.00	18.31	2.93	0.219	3.30	3.36	29.50	43.00	13.45
Mean		11.21	16.72	2.68	0.216	2.73	2.92	28.30	38.42	12.62
Mean	16	11.22	16.49	2.64	0.206	2.47	2.61	26.56	33.26	11.39
	32	11.56	18.10	2.90	0.225	3.20	2.90	28.81	38.38	12.52
	48	10.11	19.04	3.05	0.224	3.33	3.41	30.89	39.89	12.97
L.S.D. at 5%	Chemical	N.S.	0.89	2.14	0.010	0.12	N.S	1.82	0.93	0.06
	Natural	N.S.	0.91	0.15	0.005	0.09	N.S	1.64	1.59	0.12
	Interaction	N.S.	N.S.	N.S	0.008	0.16	N.S	N.S	2.75	0.21

* Fed. = 4200 m²

The content of total protein, N, P, K,. Fe, Mn, Zn and Cu recorded a good positive correlation with the increasing phosphorus levels addition. In addition, the differences between addition phosphorus fertilizers at levels within 16 up 48 units of P_2O_5/fed. were great enough to be significant at 5 % level. It means that, the best chemical quality of onion bulbs was associated with the plants which received the highest rate of phosphorus fertilizer, i.e. 48 units of P_2O_5/fed.

It could be summarized that, the addition phosphorus fertilizer at the form of calcium super-phosphate (chemical form) at higher levels gained the best values of chemical constituents in bulbs tissues. This might attributed to the chemical phosphorus form is a more availability and solubility for plant absorption. Moreover, increasing the levels of phosphorus in rooting zone caused an increase in its absorption by plants, consequently increased the ability of plant roots to uptake more elements in plant tissues. Many investigators had a good accordance with that which obtained in this script (Alt, *et al*., 1999; Ali *et al*., 2001; Almadini *et al*., 2000 and Alkaff *et al*., 2002).

From other side, the interaction between the two previous factors (phosphorus sources and rates) significantly affected the nutritional values of onion bulbs, particularly with P, K and Cu in both two experiments.

In spite of the no significant response of most elements of nutritional values as affected by the interaction treatments, but, addition, phosphorus fertilizer in the chemical form (as super-phosphate) at the highest rate, i.e. 48 units of P_2O_5/fed.gained the best results.

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