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Vegetative Growth and Chemical Parameters of Onion as Influenced by Potassium as Major and Stimufol as Minor Fertilizers

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Abstract: Two field experiments were carried out during two experimental seasons of 2009/2010 and 2010/2011 under newly sandy reclaimed soil at El-Nubaria region. The aim of these experiments is to study the vegetative growth and chemical parameters of onion plants cv. Giza-20 as influenced by levels of potassium (100 and 150 units of K_2O/fed.) as potassium sulphate (48% K_2O) applied as soil top dressing and levels of stimufol (0, 1, 2 and 3g/l) as foliar spraying for three times in 15 days interval. The obtained results strongly indicated that the vigor plant growth expressed as length, leaves number, fresh and dry weights of onion plant were detected with that plants which supplied with a higher level of potassium (150 units of K_2O). In the same regards, the higher bulb yield as tons/fed. and the size of bulb as well as mineral contents of bulb tissues were recorded with the addition of higher potassium level. Foliar spraying of onion plants by stimufol as minor nutritional fertilizer at level of 3g/l gained the best plant growth and yield if compared with the other application levels. Also, the mineral contents of bulb tissues followed the same trends of results. The interaction between the application rates of potassium and foliar applications of stimufol had no significant effect at 5% level of significance on all measured parameters in both seasons. The highest values of N, P, K, Fe, Mn, Zn and Cu in bulb tissues, bulb yield and vegetative growth properties were recorded with onion plants which received the higher potassium rate (150 units of K_2O) with foliar sprayed by stimufol at the highest dose of 3g/l.

Key words: Onion plants, Growth parameters, Bulb yield, Potassium sulphate, Foliar spraying, Mineral contents.

INTRODUCTION

Onion (*Allium cepa,* L.) is one of the most important vegetable crops grown in Egypt. The total cultivated area amounted by 87.2 thousands fed., produced about 1147.6 thousands ton and by average 13.12 tons/fed. according to Ministry of Agriculture Statistics. The production of the best fields, require that the soil must have favorable physical, chemical nutritional and biological conditions. Now more than ever the importance of an adequate supply of plant nutrients to ensure efficient crop production is being recognized. Generally, from the horticultural point of view, the yield of any plant is the most important target from any plantation. The role of potassium element has been associated with so many significant increasing in the plant growth and total yield (Fatma and Shafeek, 2000; Abd El-Al *et al.,* 2005; El-Bassiony, 2006; Aisha *et al.,* 2007; Aisha and Taalab, 2008; Shaheen *et al.,* 2009 and Shokr and Fathy, 2009).

Recently, using macro and micro nutrients through foliar fertilization is preferable to avoid not only nutrient fixation in the soil, but also leaching during irrigation. It is also recognized that supplementary foliar fertilization during crop growth can improve the mineral status of plants and increase the crop yield and quality (Kolota and Osinska, 2001). Now in Egypt, there are many foliar fertilizers containing the most macro and micro elements usually used to correct any defect in soil. Many investigators reported that, spraying the plants with foliar fertilizer caused an important role in plant growth, yield and quality (Sharaf and Fouda, 1984; El-Sayed *et al.,* 1985 and Behairy and Fatma, 1995).

The aim of the present study was to investigate the effect of using of two rates of potassium (as soil top dressing) and different levels of stimufol (as foliar spraying) on the growth and productivity of onion plant under newly sandy soil conditions.

MATERIALS AND METHODS

Two field experiments were carried out during two growing seasons of 2009/2010 and 2010/2011 at Research and Production Station of National Research Centre, El-Nubaria, El-Behera Governorate, Egypt, to investigate the effect of application of potassium fertilizer as potassium sulphate (48% K_2O) applied as soil top dressing at two rates (100 and 150 units K_2O/fed.). The amount of potassium rate was divided into two equal doses and added at 90 and 120 days after transplanting date. In addition to application of stimufol (as foliar spraying) at levels of 0, 1, 2 and 3 g/l. Stimufol was foliar sprayed for three times in 15 days interval starting at 90 days after transplanting date, on onion plant growth and productivity.

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The compositions of stimufol fertilizer were 25% nitrogen, 16% phosphorus, 12% potassium, 0.02% magnesium, 0.17% iron, 0.07% zinc, 0.085% manganese, 0.044% boron, 0.001% molybdenum, 0.085% copper and 0.01% cobalt.

The soil texture of experimental field was sandy with 95.3% sand, 0.4 % silt and 4.3% clay. Soil pH 7.9 and E.C. 2.0 ds/m. All treatments were arranged in a split plot design with 3 replicates. Where the potassium rates were distributed in the main plots and foliar spraying treatments were randomly arranged within the sub-plots. The total area of each sub-plot was 14.0 m^2 and contained 4 drip irrigated ridges of 5 m length and 0.7 m width. Uniform onion seedlings cv. Giza-20 were planted on the first week of December in both seasons, seedlings were planted on both sides of ridge at 10 cm apart. All treatments were fertilized by nitrogen at 120 units N/fed. as ammonium sulphate (20.6% N) and phosphorus at 48 units P_2O_5/fed. as calcium super-phosphate (16.0% P_2O_5). Phosphorus was applied during soil preparation, while nitrogen was divided into three equal portions and added 30, 60 and 90 days after transplanting date. All agricultural practices for onion production in the growing area were applied as recommended by Ministry of Agriculture.

A random sample of 6 onion plants were taken from each experimental sub-plot at 120 days after transplanting date to determine the vegetative growth characters, i.e. plant length, leaves number, length and diameter of each bulb and its neck, as well as fresh and dry weights of whole plant and its different organs. At harvesting time, 160 days after transplanting date, bulb yield as tons/fed. was recorded. In the same time sample of 12 bulbs were randomly taken from each sub-plot to record the physical onion bulb properties, i.e. length, diameter and average weight of bulb as well as total soluble solids (TSS).

In dried samples of onion bulb tissues N, P, K elements were determined according the methods described by Pregl (1945); Trough and Mayer (1939) and Brown and Lilleland (1946), respectively. However, Fe, Mn, Zn and Cu were determined as described by Chapman and Pratt (1978). Protein percentages in bulbs were calculated by multiplying nitrogen content by 6.25. All data obtained were statistically analyzed and mean separation was done using the least significant differences (LSD) test at 5% level as described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

A- Plant Growth Characteristics:

The response of onion plant growth characters to the application of potassium fertilizer as soil top dressing and stimufol as foliar spraying at different levels during the two experimental seasons of 2009/2010 and 2010/2011 are shown in Tables (1 and 2) and Figs. (1, 2, 3 and 4). Whereas, the addition of potassium at higher rate, i.e., 150 units K_2O/fed., gained an enhancement in all plant growth characters (length of plant and its leaves number as well as fresh and dry weights of whole onion plant and its different organs if compared with the addition of lower rate (100 units K_2O/fed.). Shortly, this superiority amounted by 43.7 and 12.1% in the first season, respectively, for total fresh and dry weights but these superiority amounted by 12.9 and 20.6% for the above same respective but in the second season. The statistical analysis of the obtained results. showed that, the

Table 1: Effect of potassium and Stimufol at different levels on vegetative growth characters of onion plant during the first season of 2009/2010.

Treatments		Plant length (cm)	No. of leaves/ plant	Neck (cm)		Bulb (cm)		Fresh weight (g)				Dry weight (g)			
Potassium fertilizers	Stimufol Spray			Length	Diameter	Length	Diameter	Leaves	Neck	Bulb	Total	Leaves	Neck	Bulb	Total
100 units K_2O/fed.	Control	40.67	8.00	8.78	1.57	3.48	5.33	27.19	13.88	69.78	110.85	3.33	2.22	12.67	18.22
	Stimufol 1g	45.00	10.33	7.38	1.80	5.11	6.57	30.38	15.32	73.30	119.00	3.39	2.59	14.02	20.01
	Stimufol 2g	52.00	11.33	5.93	1.83	5.56	6.33	37.74	16.03	91.78	145.56	3.50	2.49	12.66	18.65
	Stimufol 3g	53.33	11.67	6.23	2.00	5.84	7.27	39.86	22.28	103.24	165.37	4.12	2.44	13.99	20.55
Mean		47.75	10.33	7.08	1.80	5.00	6.38	33.79	16.88	84.53	135.20	3.59	2.44	13.34	19.36
150 units K_2O/fed.	Control	47.33	9.33	11.42	2.13	4.86	5.70	32.66	15.26	87.73	135.65	3.79	2.57	13.29	19.64
	Stimufol 1g	53.67	12.67	10.22	2.37	6.44	6.63	44.96	18.35	109.14	172.45	4.35	2.47	13.62	20.44
	Stimufol 2g	54.00	12.00	9.48	2.60	6.70	6.16	46.40	23.23	156.07	225.70	4.17	2.48	14.43	21.08
	Stimufol 3g	59.53	11.00	6.70	2.93	7.23	7.60	51.99	27.03	164.64	243.66	5.58	2.39	15.75	23.71
Mean		53.63	11.25	9.46	2.51	6.30	6.52	44.00	20.97	129.39	194.37	4.47	2.48	14.27	21.22
Average	Control	44.00	8.67	10.10	1.85	4.17	5.52	29.92	14.57	78.76	123.25	3.56	2.40	12.98	18.93
	Stimufol 1g	49.33	11.50	8.80	2.08	5.77	6.60	37.67	16.83	91.22	145.72	3.87	2.53	13.82	20.23
	Stimufol 2g	53.00	11.67	7.71	2.22	6.13	6.25	42.07	19.63	123.93	185.63	3.84	2.48	13.55	19.87
	Stimufol 3g	56.43	11.33	6.47	2.47	6.54	7.43	45.93	24.66	133.94	204.52	4.85	2.41	14.87	22.13
L.S.D. at 5% level	Fertilizer	1.08	0.25	0.21	0.03	0.11	0.15	0.55	0.61	13.70	13.74	0.17	N.S.	0.36	0.50
	Spray	3.01	2.01	1.34	0.17	0.57	0.53	9.83	2.50	30.14	25.93	0.42	N.S.	1.25	1.17
	Interactions	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

difference within two rates of potassium application was great enough to reach the 5% level of significant. These were true in both seasons for all growth parameters with exception of neck dry weight of onion plant in the first season and fresh weight of leaves in the second season. The length and diameter of onion bulb and its neck at vegetative sample (120 days after transplanting date) as influenced by the application of potassium and stimufol followed the same trends as mentioned before during both seasons of study. It means that the addition of potassium at 150 units K_2O/fed. resulted in vigor plant growth as well as the highest values of length and diameter of onion bulb and its neck. It could be concluded that, obtained results showed the superior effect of

potassium on onion plant growth are in agreement with those reported by Singh *et al*. (1991); Vachihani and Patel (1996); Abd El-Al *et al*. (2005) and Shaheen *et al*. (2009).

Table 2: Effect of potassium and Stimufol at different levels on vegetative growth characters of onion plant during the second season of 2010/2011.

Treatments		Plant length (cm)	No. of leaves/ plant	Neck (cm)		Bulb (cm)		Fresh weight (g)				Dry weight (g)			
Potassium fertilizers	Stimufol spray			Length	Diameter	Length	Diameter	Leaves	Neck	Bulb	Total	Leaves	Neck	Bulb	Total
100 units K_2O/fed.	Control	32.00	6.67	11.23	1.50	4.43	4.67	16.56	13.80	42.90	73.27	2.92	2.90	10.90	16.72
	Stimufol 1g	36.33	8.00	10.80	1.70	5.67	4.80	18.69	14.27	53.71	86.67	2.50	2.88	17.24	22.61
	Stimufol 2g	34.33	7.00	8.90	1.30	5.83	4.63	21.69	12.83	45.00	79.52	2.54	3.17	24.52	30.23
	Stimufol 3g	38.00	8.67	11.33	1.27	6.00	6.40	21.47	12.48	67.36	101.30	3.18	3.61	19.98	26.77
Mean		35.17	7.58	10.57	1.44	5.48	5.13	19.60	13.34	52.24	85.19	2.78	3.14	18.16	24.08
150 units K_2O/fed.	Control	31.00	6.33	11.67	1.43	4.37	4.40	15.57	17.67	53.14	86.38	2.77	3.21	20.90	26.88
	Stimufol 1g	43.33	8.33	11.73	1.27	5.33	4.80	18.94	15.40	64.69	99.03	3.18	3.15	24.75	31.08
	Stimufol 2g	47.00	9.00	10.60	1.43	6.53	6.67	22.15	13.75	59.66	95.55	2.98	3.84	23.85	30.67
	Stimufol 3g	46.00	10.00	11.67	1.40	6.87	7.37	25.19	11.51	67.03	103.74	3.10	2.98	21.48	27.56
Mean		41.83	8.42	11.42	1.38	5.78	5.81	20.46	14.58	61.13	96.17	3.01	3.30	22.75	29.05
Average	Control	31.50	6.50	11.45	1.47	4.40	4.53	16.07	15.74	48.02	79.82	2.85	3.06	15.90	21.80
	Stimufol 1g	39.83	8.17	11.27	1.48	5.50	4.80	18.82	14.83	59.20	92.85	2.84	3.01	21.00	26.85
	Stimufol 2g	40.67	8.00	9.75	1.37	6.18	5.65	21.92	13.29	52.33	87.54	2.76	3.51	24.18	30.45
	Stimufol 3g	42.00	9.33	11.50	1.33	6.43	6.88	23.33	11.99	67.20	102.52	3.14	3.30	20.73	27.17
L.S.D. at 5% level	Fertilizers	2.43	0.42	N.S.	0.03	0.15	0.18	N.S.	0.03	0.48	0.36	0.07	0.01	1.48	1.46
	Spray	5.44	0.97	N.S.	N.S.	0.94	1.04	3.01	0.12	5.69	4.79	N.S.	0.09	5.11	5.37
	Interactions	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	0.17	N.S.	N.S.	N.S.	0.12	N.S.	N.S.

However, the promoting effect of potassium fertilizer on the growth of plants may be due to that potassium is the prevalent cation in plant and involved in maintenance of ionic balance in cells and it bounds ionically to the enzyme pyruvate kinase, which is essential in respiration and carbohydrates metabolism (Edmond *et al*., 1981). Also, potassium helps in several physiological processes and uptake of other nutrients. Potassium is known to play a vital role in photosynthesis and carbohydrate formation in plant. It has also been shown that K plays a key role in the activation of more than 60 enzymes in plants. Contrast to other elements that are involved in the formation of cell structure, K functions in the cell sap. The high mobility of K permits it to move quickly from cell to cell or from older parts to newly developed tissues and storage organs. It has also, a role in stomata respiration, photosynthetic transfer; crop development studies on the removal of various nutrients during harvest of spice crops showed that all the spice remove more amount of K than any other element (Sadanandan *et al*., 2002).

Regarding the application of stimufol as foliar spraying, data presented in Tables (1 and 2) clearly showed that all levels of application caused an increase in all vegetative growth parameters of onion plant over than the control treatment (without stimufol). Moreover, with increasing the level of application within the range up to 3 g/l the best vigor was resulted. By other mean, foliar spraying of stimufol at 3g/l recorded a superiority in total fresh and dry weights of whole plant over the control treatment by 66 and 16.9%, respectively, in the first season and by 28.4 and 24.6% for the same respective in the second season. Also, foliar application of stimufol caused stimulation in length and diameter of neck and bulb of onion plant. It could be concluded that, the plant growth criteria's of onion plant, i.e. length of plant, average leaves number, total fresh and dry weights of whole onion plant at 120 days after transplanting date as well as length and diameter of onion bulb and its neck, all of them recorded the highest values with the application of stimufol at rate of 3g/l as a minor source of plant nutrition. The previous studies recorded by El-Sayed *et al*. **(**1985) Behairy and Fatma, (1995); Adam and Abdalla, (1997) and Fatma and Shafeek, (2000) are supported the obtained results. The interaction between potassium rates and stimufol levels during the two experimental seasons had no significant effect on all plant growth parameters except for fresh and dry weights of neck in the second season only. It means that each main experimental factors act independently.

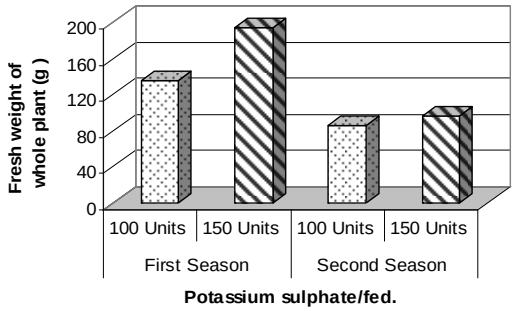

Fig. 1: Effect of potassium fertilizer at different rates on the fresh weight of whole plant during the two experimental seasons.

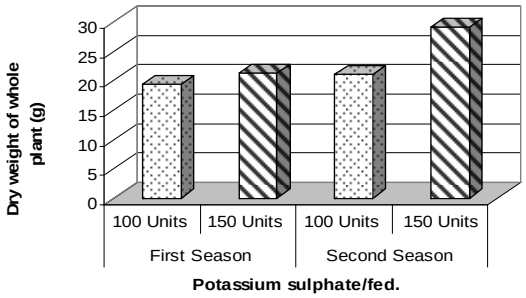

Fig. 2: Effect of potassium fertilizer at different rates on the dry weight of whole plant during the two experimental seasons**.**

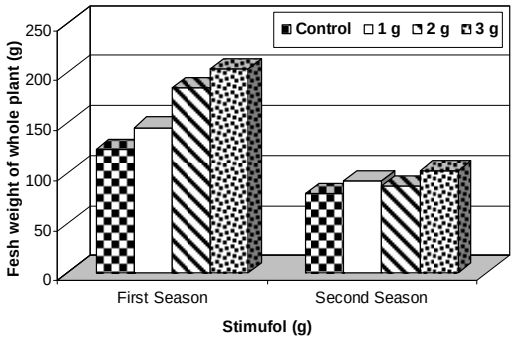

Fig. 3: Effect of stimufol application at different levels on the fresh weight of whole plant during the two experimental seasons.

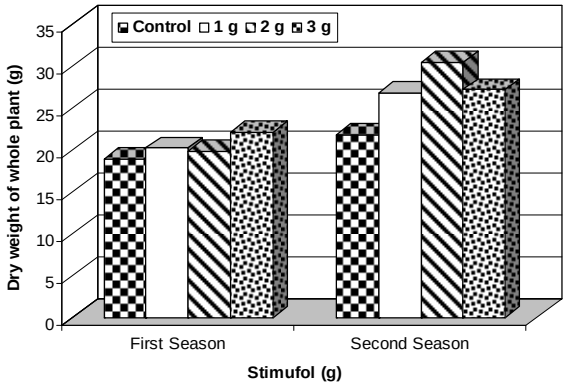

Fig. 4: Effect of stimufol application at different levels on the dry weight of whole plant during the two experimental seasons.

B- Onion Bulbs Yield and Its Physical Properties:

Table (3) and Figs. (5, 6, 7 and 8) presented the effect of potassium applied as soil top dressing and foliar spraying of stimufol on bulb yield of onion as ton/fed. and some physical properties (average bulb weight; bulb length and bulb diameter as well as total soluble solids (TSS) during the seasons of 2009/2010 and 2010/2011. Potassium added as soil top dressing at rate of 150 units K_2O/fed. caused a significant increase over addition of the lower rate (100 units K_2O/fed.). These findings were completely true for all measured parameters presented in Table (3). With other means the higher potassium rate recorded superiority in bulb yield amounted by 24.4 and 18.3% in the first and second seasons, respectively.

Moreover, the response of physical properties of onion, average bulb weight and bulb diameter as well as total soluble solids (TSS) values, all of them followed the same trend as mentioned above. It could be concluded that the heaviest bulbs yield and its best values of some physical properties, which resulted might be attributed to the best vigor plant growth characters which previously mentioned and shown in Tables (1 and 2). The trend of the obtained results are in good accordance with that reported by many investigators such as Bhande *et al*. (1998); Singh and Mohanty, (2000); Abd El-Al *et al*. (2005); El-Bassiony, (2006); El-Desuki *et al*. (2006); Aisha and Telaab, (2008) and Shaheen *et al*. (2009).

Foliar application of stimufol as minor nutritional fertilizer for onion plants at different levels during the two experimental seasons are shown in Table (3). It evident that all level of stimufol enhanced onion bulb yield and its properties over the check treatments. Moreover, the obtained results revealed that a gradual and constant increase in yield parameters were strongly associated with increasing the level of stimufol application. It means that the heaviest bulb yield as ton/fed (15.373 and 15.663) in the first and second seasons, respectively, were obtained with the foliar application of stimufol at the highest level (3 g/l). Also data presented in Table (3) indicated that the physical characters of onion bulb and TSS values followed the same trends of bulb yield as previously shown. Generally the statistical analysis of the collected data revealed that the differences with using different levels of stimufol were great enough to reach significance at 5% level. These were true for bulb yield, average bulb weight and bulb dimensions as well as TSS values in both experimental seasons.

It could be concluded that the superiority of total bulb yield, average bulb weight and bulb dimensions as well as the values of TSS which resulted when stimufol was applied might be due to the chemical content of this product, where it contained some major and minor elements needed for onion plant to promote the vegetative plant growth, consequently reflected on plant yield. The requirements of plant growth for minor and/or major elements as foliar application were studied by many workers such as El-Sherbeny *et al*. (1987); Behairy and Fatma (1995); Adam and Abdalla (1997) and Fatma and Shafeek (2000). However the obtained findings herein are supported by their findings.

Table (3) showed also that no significant effect was detected with the effect of interaction treatments (potassium rates and stimufol levels) on bulb yield and its properties during the two growing seasons, except for bulb diameter in the first season only.

Table 3: Effect of potassium and Stimufol at different levels on bulb yield and its physical quality during seasons of 2009/2010 and 2010/2011.

Treatments		Yield (ton/ fed.)	Average weight of bulb	Bulb (cm)		TSS	Yield (ton/ fed.)	Average weight of bulb	Bulb (cm)		TSS
Potassium fertilizers	Stimufol spray			Length	Diameter				Length	Diameter	
		2009/2010					2010/2011				
100 units K_2O/fed.	Control	10.577	112.50	5.47	6.14	10.18	10.290	110.88	4.82	5.86	11.05
	Stimufol 1g	12.340	163.71	7.39	7.41	10.38	13.863	160.05	6.21	6.55	11.76
	Stimufol 2g	14.259	172.86	6.89	7.13	11.39	14.527	172.74	7.31	7.18	12.44
	Stimufol 3g	14.636	192.50	7.01	6.64	11.66	15.347	184.39	7.54	7.41	12.35
Mean		12.953	160.39	6.69	6.83	10.90	13.507	157.02	6.47	6.75	11.90
150 units K_2O/fed.	Control	10.170	160.45	4.94	6.09	10.37	11.093	120.22	4.88	6.23	11.18
	Stimufol 1g	15.447	174.85	7.19	7.63	11.41	13.793	175.44	6.43	6.81	11.91
	Stimufol 2g	15.065	174.06	6.67	7.82	12.83	15.830	175.16	7.78	7.12	12.71
	Stimufol 3g	16.111	191.34	7.83	8.39	13.49	15.980	198.65	8.10	7.68	12.87
Mean		14.198	175.17	6.66	7.49	12.02	14.174	167.37	6.80	6.96	12.17
Average	Control	10.373	13.48	5.21	6.12	10.28	10.692	115.55	4.85	6.05	11.12
	Stimufol 1g	13.894	169.28	7.29	7.52	10.89	13.828	167.75	6.32	6.68	11.84
	Stimufol 2g	14.662	173.46	6.78	7.48	12.11	15.178	173.95	7.54	7.15	12.58
	Stimufol 3g	15.373	191.92	7.42	7.52	12.57	15.663	191.52	7.82	7.55	12.61
L.S.D. at 5% level	Fertilizers	0.445	7.28	N.S.	0.06	0.20	0.189	3.07	N.S.	0.09	0.02
	Spray	1.441	31.16	0.93	0.55	0.58	0.917	23.06	0.83	0.38	0.15
	Interactions	N.S.	N.S.	N.S.	0.78	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

C- Nutritional Values:

The effect of potassium fertilizer as soil top dressing and stimufol as foliar spraying at different levels on bulb nutritional values (protein, N, P, K, Fe, Mn, Zn and Cu contents) during both seasons of study are shown in Tables (4 and 5). Data shown strongly demonstrated that using potassium fertilizer at rate of 150 units K_2O/fed. significantly gained the highest values of protein, N, P, K, Fe, Mn, Zn and Cu contents when compared with the lower rate of potassium (100 units K_2O/fed.).

It could be concluded that the promotion effect of potassium fertilizer on the nutritional values of onion bulb tissues might be attributed to that potassium is prevalent cation in plant and involved in maintenance of ionic balance in cells and it bound ionically to the enzyme pyruvate kinase which is essential in respiration and

carbohydrates metabolism (Edmond *et al*., 1981)**.** However, the obtained results showed that the superior effect of potassium fertilizer on nutritional values of onion tissues are in agreement with that reported by Agwah and Mahmoud (1994); Ahmed *et al*. (2004); Badawy *et al*. (2004); El-Bassiony (2006); Aisha and Taalab (2008); Shaheen *et al*. (2009) and Shokr and Fathy (2009).

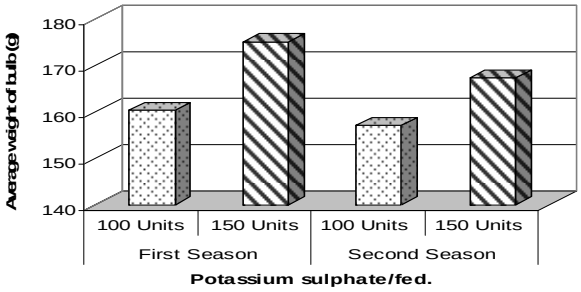

Fig. 5: Effect of potassium fertilizer at different rates on the average weight of bulb during the two experimental seasons.

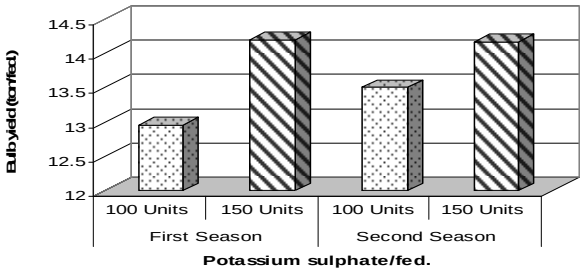

Fig. 6: Effect of potassium fertilizer at different rates on bulb yield during the two experimental seasons.

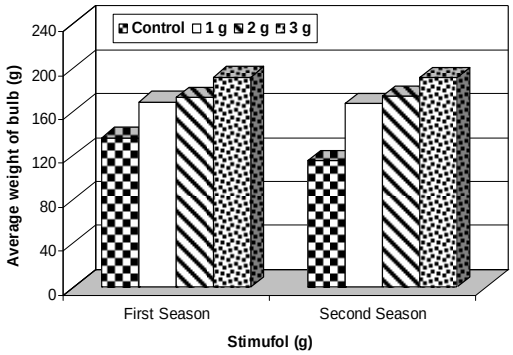

Fig. 7: Effect of stimufol application at different levels on the average weight of bulb during the two experimental seasons.

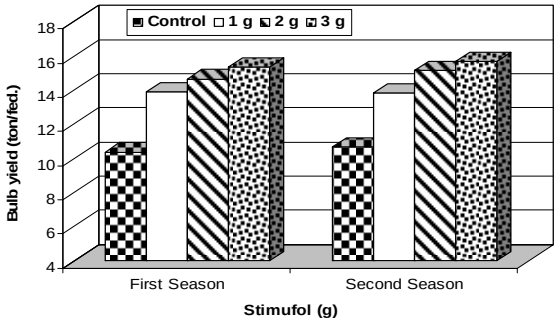

Fig. 8: Effect of stimufol application at different levels on bulb yield during the two experimental seasons.

Table 4: Effect of potassium and Stimufol at different levels on chemical contents of onion bulb during the first season of 2009/2010.

Treatments		%				ppm			
Potassium fertilizers	Stimufol spray	Protein	N	P	K	Fe	Mn	Zn	Cu
100 units K_2O/fed.	Control	10.04	1.61	0.28	2.52	249.33	54.67	34.00	16.33
	Stimufol 1g	10.15	1.62	0.37	2.72	263.33	65.00	43.00	18.67
	Stimufol 2g	10.33	1.65	0.44	2.65	272.67	71.33	54.33	24.33
	Stimufol 3g	11.19	1.79	0.46	3.56	288.33	83.00	66.00	23.00
Mean		10.43	1.67	0.39	2.85	268.42	68.50	49.33	20.58
150 units K_2O/fed.	Control	9.56	1.53	0.31	2.62	255.67	58.00	36.00	17.67
	Stimufol 1g	10.50	1.68	0.47	3.58	290.67	73.67	49.33	26.00
	Stimufol 2g	11.40	1.82	0.46	3.73	293.33	83.00	67.00	29.00
	Stimufol 3g	11.98	1.92	0.50	3.61	299.67	92.00	75.67	31.00
Mean		10.86	1.74	0.44	3.39	284.83	76.67	57.00	25.92
Average	Control	9.80	1.57	0.30	2.57	252.50	56.33	35.00	17.00
	Stimufol 1g	10.32	1.65	0.42	3.15	277.00	69.33	46.17	22.33
	Stimufol 2g	10.86	1.74	0.45	3.19	283.00	77.17	60.67	26.67
	Stimufol 3g	11.58	1.85	0.48	3.59	294.00	87.50	70.83	27.00
L.S.D. at 5% level	Fertilizers	0.23	0.04	0.004	2.57	1.46	0.59	2.22	0.84
	Spray	1.14	0.18	0.03	3.15	8.14	4.60	7.82	3.38
	Interactions	N.S.	N.S.	N.S.	3.19	N.S.	N.S.	N.S.	N.S.

Table 5: Effect of potassium and Stimufol at different levels on chemical content of onion bulb during the second season of 2010/2011.

Treatments		%				ppm			
Potassium fertilizers	Stimufolspray	Protein	N	P	K	Fe	Mn	Zn	Cu
100 units K_2O/fed.	Control	10.25	1.64	0.32	2.67	253.33	63.67	40.00	16.67
	Stimufol 1g	10.38	1.66	0.37	2.81	257.33	82.00	50.33	19.00
	Stimufol 2g	10.67	1.71	0.42	2.89	263.67	87.67	63.00	22.00
	Stimufol 3g	12.00	1.92	0.44	3.41	275.67	87.33	73.33	25.33
Mean		10.82	1.73	0.39	2.95	262.50	80.17	56.67	20.75
150 units K_2O/fed.	Control	10.31	1.65	0.35	2.50	256.00	77.00	44.67	19.67
	Stimufol 1g	11.25	1.80	0.46	3.26	276.67	90.67	65.33	26.00
	Stimufol 2g	12.40	1.98	0.48	3.93	283.00	99.67	75.67	28.33
	Stimufol 3g	12.31	1.97	0.50	3.81	299.00	107.67	84.33	29.67
Mean		11.57	1.85	0.45	3.37	278.67	93.75	67.50	25.92
Average	Control	10.28	1.65	0.34	2.58	254.67	70.33	42.33	18.17
	Stimufol 1g	10.81	1.73	0.42	3.04	267.00	86.33	57.83	22.50
	Stimufol 2g	11.53	1.85	0.45	3.41	273.33	93.67	69.33	25.17
	Stimufol 3g	12.16	1.95	0.47	3.61	287.33	97.50	78.83	27.50
L.S.D. at 5% level	Fertilizers	0.08	0.01	0.004	0.12	2.07	0.67	2.67	0.35
	Spray	1.31	0.21	0.03	0.42	7.46	6.35	6.07	1.65
	Interactions	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

With increasing stimufol level for onion plant spraying up to 3g/l caused an enhancement in the nutritional value of onion bulb tissues. It means that foliar application of stimufol resulted more nutritional values if compared with the control treatment. Moreover, onion plants which sprayed by 3g/l of stimufol gained the best nutritional values. These findings are completely similar in both seasons. The obtained results are in good accordance with that reported by Sharaf and Fouda (1984); El-Sayed *et al*. (1985); Thalooth *et al*. (1989) and Fatma and Shafeek (2000).

The interaction within treatments of potassium rates and stimufol levels had no statistical variation on all nutritional values except for K content in the first season only. Where the highest values were recorded when onion plants fertilized with potassium at rate of 150 units K_2O/fed. in addition to spray with stimufol at level of 3g/l.

Conclusions:

In conclusion it could be recommended that supplying onion plants grown under newly sandy soil conditions with potassium at rate of 150 units of K_2O/fed. as soil top dressing plus foliar spraying by stimufol at level of 3g/l for three times in 15 days interval to achieve the highest values of vegetative growth, bulb yield and quality as well as bulb nutrients contents.

REFERENCES

Abd El-Al, Faten S., M.R., Shafeek, A.A. Ahmed and A.M. Shaheen, 2005. Response of growth and yield of onion plants to potassium fertilizers and humic acid. Journal of Agricultural Sciences, Mansoura Univeristy, 30(1): 441-452.

Adam. S.A. and A.M. Abdalla, 1997. The role of foliar fertilization on the growth and productivity of pea (*Pisum sativum* L.) plants cultivated under different sowing methods. Egyptian Journal of physiological Sciences, 21: 295-314.

Agwah. E.M.R. and A.F. Mahmoud, 1994. Effect of some nutrient sources and cultivars on tomato fruit set and yield. Bulletin of Faculty of Agriculture, Cairo University, 45: 137-148.

Ahmed. A.A., M.M.H., Abd El-Baky, Faten S. Abd El-Al and A.M. Shaheen, 2004. The productivity of Jew's mallow plant as influenced by different NPK fertilization. Journal of Agricultural Sciences, Mansoura University, 29(10): 6551-6561.

Aisha. H.A. and A.S. Taalab, 2008. Effect of natural and/or chemical potassium fertilizers on growth, bulbs yield and some physical and chemical constituents of onion (*Allium cepa*, L.). Research Journal of Agriculture and Biological Sciences, 4(3): 228-237.

Aisha. H.A., A. Fatma Rizk, A.M. Shaheen and Mona M. Abdel-Mouty, 2007. Onion plant growth, bulbs yield and its physical and chemical properties as affected by organic and natural fertilization. Research Journal of Agriculture and Biological Sciences, 3(5): 380-388.

Badawy. M.A., S.A. Shehata and M.M. El-Mogy, 2004. Effect of fertillization with K and Ca on vegetative growth, yiled and quality of some snap bean cultivars. Annals of Agricultural Sciences, Moshtohor, 24(1): 167-176.

Behairy. A.G. and Fatma A. Rizk, 1995. Growth and yield of pea (*Pisum sativum* L.) plants as affected by some foliar fertilizers. Egyptian Journal of Applied Sciences, 10(11): 274-281.

Bhande. S.R., S.B. Sharma and A.B. Ghougule, 1998. Effect of bio fertilizer in combination with nitrogen through organic and inorganic sources on yield and quality of onion. New Delhi, Research and Development Foundation, 17(2): 1-3.

Brown. J.D. and O. Lilleland, 1946. Rapid determination of potassium and sodium in plant material and soil extracts by flame photometry. Proceeding of American Society of Horticulture Sciences, 48: 341-346.

Chapman. H.D. and P.F. Pratt, 1978. Methods of analysis for soils, plants and waters. Chapman Publishers, Riverside, California, USA.

Edmond. J.B., T.L. Senn, F.S. Znderw and R.G. Halfacre, 1981. Fundamentals of Horticulture. published by Tata McGrow-Hell, Publishing Company Limited, New Delhi India.

El-Bassiony, A.M., 2006. Effect of potassium fertilization on growth, yield and quality of onion plants. Journal of Applied Science Research, 2(10): 780-785.

El-Desuki. M., M.M. Abdel-Mouty and A.H. Ali, 2006. Response of Onion Plants to additional dose of potassium application. Journal of Applied Science Research, 2(9): 592-597.

El-Sayed. M.M., A.M. Shaheen and R.M. Khalil, 1985. Growth and productivity of pea plants (*Pisum sativum* L.) as responded to Stimufol fertilizer combined with Gibberellin (GA3) application. Minufiya Journal of Agriculture Research, 10(2): 1005-1016.

El-Sherbeny. S.E., M.S. Hussein and M.S. Mandour, 1987. A comparative study on the effect of some fertilizers on fenugreek plant. Egyptain Journal of Agronomy, 12(1-2): 12-29.

Fatma, A. Rizk and M.R. Shafeek, 2000. Response of growth and yield of *Vicia faba* plants to foliar and bio-fertilizers. Egyptian Journal of Applied Sciences, 15(12): 652-670.

Gomez, K.A. and A.A. Gomez, 1984. Statistical procedures for Agricultural Research (2nd Ed.), pp. 457-423. John Wiley and Sons. International Science Publisher, New York, USA.

Kolota, E. and M. Osinska, 2001. Efficiency of foliar nutrition of field vegetables grown at different nitrogen rates. Acta Horticulturae, 563: 87-91.

Pregl, F., 1945. Quantitative organic micro analysis. 1st Ed., Achrdill Ltd. London, UK.

Sadanandan, A.K., K.V. Peter and S. Hamza, 2002. Role of potassium nutrition in improving yield and quality of spice crops in India. International Potash Institute, Switzerland, pp: 445-454.

Shaheen, A.M., Faten S. Abd El-Al, A.A. Ahmed and Fatma A. Rizk, 2009. The influence of application methods of potassium fertilization on growth, pods yield and its quality of pea plants. Journal of Agricultural Sciences, Mansoura University, 34(12): 11253-11265.

Sharaf. A.L. and E.E. Fouda, 1984. The effect of Azospirillurm on improved varieties of bhendi. South Indian Horticulture, 43(1/2): 52-53. (C.F. Hort. Abst., 66, 11: 9551).

Shokr. M.M.B. and El-S. Fathy, 2009. Some foliar application for improving snap bean (*Phoseolus vulglaris* L.) quality and yield at fall season. Journal of Agricultural Sciences, Mansoura University, 34(5): 5089-5106.

Singh, S.P. and C.R. Mohanty, 2000. A note on effect of nitrogen and potassium on the growth and yiled of onion. Journal of Horticulture, 26(2): 70-71.

Singh. T., S.B. Singh and B.N. Singh, 1991. Effect of nitrogen, potassium and green manure on growth and yield of rainy season onion (*Allium cepa* L.). Journal of Agriculture Research, 4(1): 57-60.

Thalooth. A.T., M.H. Taha and M.A. El-Seesy, 1989. Response of chemical composition and yield of soybean to foliar spraying of Zn and different phosphatic fertilizers. Annals of Agricultural Sciences, Faculty of Agriculture, Ain Shams University, 34(2): 925-937.

Trough. E. and A.H. Mayer, 1939. Improvement in the determines calorimetric method for phosphorus and arsenic. Indian Engineering Chemical Annual Ed., 1: 136-139.

Vachihani. N.U. and Z.G. Patel, 1996. Growth and yield of onion as influence by levels of nitrogen, phosphorus and potash under south Gujarat condition. Progressive Horticulture, 25(3/4): 16-167.