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Response of Potato Plants to Sources and Rates of Potassium Fertilizer

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ABSTRACT

Two field experiments were carried out at a Private Farm in Meet Habib Village, Gharbia Governorate, during Winter seasons of 2015/2016 and 2016/2017 to determine the influence of potassium fertilizers levels, foliar application treatments and interactions on growth, yield and some chemical constituents in both leaves and tubers of potato cv. Spunta. Mineral fertilizing with 75 % of the recommended doses recorded the highest values of vegetative growth characters, total marketable tubers yield/fed, total soluble solids percentage (TSS) and vitamin-C content in fresh potato in both seasons. While, the highest values of total carbohydrates and starch percentages, nitrite and nitrate concentrations in fresh potato tubers were obtained from fertilizing with 100 % of the recommended doses in both seasons. Total sugars percentage in fresh potato tubers had reverse trend of all studied characters in both seasons. Foliar spraying potato plants four times with commercial fertilizer (MegaPot as a source of nitrogen, potassium and sulphur) at the rate of 1.5 g/liter water exceeded other foliar application treatments and produced the highest values of vegetative growth characters, yield and quality parameters of tubers, except total sugars percentage, nitrite and nitrate concentrations in fresh potato tubers. It can be concluded that mineral fertilizing potato by 75 % of the recommended dose as a soil application in addition to foliar spraying four times with commercial fertilizer MegaPot (as a source of nitrogen, potassium and sulphur) at the rate of 1.5 g/liter water in each spraying is the best to obtain high growth, yield, chemical composition and quality of potato Spunta cultivar.

Keywords: Potato, potassium fertilizers levels, K-levels, foliar spraying treatments, growth, yield, quality.

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the members of the family Solanaceae and is one of the most important food crops all over the world including Egypt. Potato tubers are a good source of carbohydrates, proteins, vitamins, and minerals in human nutrition (Blagoeva *et al.*, 2004). In Egypt, the cultivated areas of potato in 2014 were 409372 feddan producing 4.611 million tons with an average yield of 11.26 tons/fed (FAO, 2017).

Potatoes are short-lived, high yield yields and comprehensive yields. The balanced use of nutrients is essential for sustainable crop productivity. In many potato-producing areas nitrogen fertilizers (N) and phosphorus (P) are used, while the application of potassium (K), which leads to a serious reduction in the potassium state in the soil from potato growing areas (Pervez *et al.*, 2013). Where, potassium is absolutely necessary element for potatoes. When potassium deficiency is observed the plants are short, leaves become pale green and later in the vegetation at leaves ends and tops they become necrotic (Kumar and Sharma, 2013). Potassium deficiency is found when the content in leaves is below 1.00 %, but optimal content of potassium in potato leaves is from 5.00 to 6.60 %. It play a crucial role in the higher productivity of potato tubers because they play an important role in the process of photosynthesis and regulate the opening and closing of insulators, and prefer to develop high energy which helps in transporting the appropriate nutrients in a timely manner and water absorption in plants (Benton Jones, 2012). Grzebisz *et al.* (2015) showed that potato yields responded positively to increasing potassium dose from 0 to 80, 160, or 240 kg K_2O/ha. Razaq *et al.* (2015) reported that the tallest potato plants, maximum number of leaves/plant, maximum number of tubers/plant and total tubers yield were recorded by using potassium fertilizer at the rate of 150 kg/ha. Shunka *et al.* (2016) concluded that potassium rates (0, 34.5, 69.0 and 103.5 kg K_2O/ha) significantly affected potato plant height and marketable tuber numbers.

Therefore, it is better to apply 69.0 kg/ha potassium for potato production to obtain reasonable economic yield at sites similar to experimental locations. Zelelew and Ghebreslassie (2016) declared that tubers number, diameter of tuber, tubers weight, total tubers yield and TSS % showed significant differences due to potassium levels (0, 75, 150, 225 and 300 kg K_2O/ha). The highest tubers weight and yield recorded from application of 300 kg K_2O/ha. Zelelew *et al.* (2016) stated that potassium fertilizer levels (0, 75, 150, 225 and 300 kg K_2O/ha) had significant effects on number of leaves per plant, plant height and yield parameters. They added that using potassium fertilizer according to soil requirements will have good influence on tubers yield. Abou Zeid and Abd El-Latif (2017) showed that significant differences were detected among potassium fertilizer rates (80, 100 and 120 kg K_2O/fed) on tuber diameter, tubers weight, total tubers yield and starch content of tubers. Shunka *et al.* (2017) revealed that application of potassium at the rate of 103.5 kg/ha significantly produced a higher potato plants than other rates (0, 34.5, 69 and kg K_2O/ha). Application of potassium at the rate of 103.5 kg/ha produced significantly a higher marketable yield than all other rates.

In high soil pH as in Egyptian soil, it is known that micronutrients as well as some large nutrients may be limited. Paper products containing multiple foodstuffs may correct these deficiencies, giving rise to growth and development. Paper applications are often the most effective economic method for correcting plant mineral deficiencies, especially when competition for carbohydrates among plant grasses occurs and nutrient uptake is restricted from soil (Marschner, 2012). Many compounds used in paper-based fertilizer products, Organic natural may have advantages because it is more environmentally safe and has more efficient work lengthening. Qadri *et al.* (2015) indicated that foliar application of nitrogen fertilizer (urea) remained better regarding vegetative growth, productivity and quality of potato. Ghosh *et al.* (2017) showed that foliar application potato plants with potassium schoenite (double sulfate of potassium and magnesium, which composed of 22.24% potassium oxide and 90% magnesium oxide) significantly enhanced plant growth (height of plant and dry matter accumulation), yield and quality parameters (ascorbic acid, specific gravity and total sugars). Moinuddin *et al.* (2017) concluded that

foliar application either micronutrient alone or mixture or in combination with NPK gone rise to best vegetative growth of potato (plant height, number of leaves per plant and number of branches per plant) and highest tubers yield of 22.45 t/ha.

Thus, the aim of this investigation was to study the effect of potassium fertilizers levels and foliar application treatments as well as their interaction on growth, yield and quality of potato under the environmental conditions of Meet Habib Village, Gharbia Governorate, Egypt.

MATERIALS AND METHODS

These experiments were set out in a strip-plot design with three replicates in both seasons. The vertical plots were allocated to three levels of mineral potassium fertilizers (K-levels) as a soil application (100, 75 and 50 % of the recommended dose *i.e.* 96.0, 72.0 and 48.0 kg K_2O/fed. Potassium fertilizer in the form of potassium sulphate (48 % K_2O) at formerly mentioned rates was applied as side-dressing in two equal doses, the first dose before the second irrigation and the second dose before the third irrigation.

The horizontal plots were assigned to four foliar application treatments *i.e.* without foliar spraying (control treatment), spraying with commercial fertilizer (KTS) as a source of potassium and sulphur (36 % K_2O and 25 % S) at the rate of 2.5 ml/liter water, commercial fertilizer (MegaPot) as a source of nitrogen, potassium and sulphur (9 % N, 40 % K_2O and 15.69 % S) at the rate of 1.5 g/liter water, commercial fertilizer potassium sulphate (K_2SO_4) as a source of potassium and sulphur (50 % K_2O and 17 % S) at the rate of 10 g/liter water in each spraying.

Each plot area was 16.0 m^2 which contained 2 ridge, 10 m long and 0.8 m width. The physical and chemical properties of soil in the experimental plots are presented in Table 1.

Table 1. Physical and chemical analyses of experimental soil during 2015/2016 and 2016/2017 seasons.

Soil properties		2015/2016	2016/2017
Particle size distribution (%)	Clay	22.53	23.05
	Silt	52.34	50.93
	Fine sand	21.38	22.85
	Coarse sand	3.75	3.17
	Texture class	Loamy	Loamy
Some physical and chemical properties	pH (1 : 2 soil water suspension)	8.05	7.98
	EC dS m^{-1} (in saturated extract)	1.17	1.05
	SP %	53.6	52.5
	$CaCO_3$ %	4.15	3.84
	Organic matter (%)	0.93	1.06
Available nutrients (mg/kg)	N	58.70	59.80
	P	5.92	6.13
	K	168.40	174.90

The planting date was on 27th December in both seasons. Tuber seed were placed at a uniform distance 20 cm apart and 20 cm depth. The harvesting was done after 120 days from planting date in both seasons of this study.

Phosphorus was added once in the form of calcium super phosphate (15.5 % P_2O_5) during soil preparation at the rate of 75 kg P_2O_5/fed. The nitrogen fertilizer was applied at the recommended level (150 kg N/fed) as side-dressing in three equal doses, the first dose in the form of ammonium sulphate (20.6 % N) during soil preparation as a stimulant dose, the second dose in the form of ammonium sulphate also after full emergence and the third dose in the form of ammonium nitrate (33.5 % N) after two weeks from the second dose. Surface irrigation was used, the first irrigation was done after 25 days from planting, while the following ones were carried regularly and stopped after two weeks before harvesting. The cultural practices such as hilling weeds, pest and diseases control were done following the guidelines given by Ministry of Agriculture.

At 90 days of planting representative samples of 5 plants randomly taken from every plot to measure vegetative growth of plants *i.e.* plant height (cm), number of leaves per plant, fresh weight/plant (g), dry matter percentage of potato plant and tuber.

At 120 days from planting all tubers of plants grown in each plot were harvested to recorded total marketable tubers yield (t/fed). Yield of good shapes, healthy tubers and without commercial disorders.

Also, at 120 days from planting, quality parameters of tubers were estimated as follows:

- Total carbohydrates percentage: It was determined according to Somogy (1952).
- Total sugars percentage: It was determined according to the method of Forsee (1938).
- Starch content percentage: It was determined in dry matter of tuber according to Somogy (1952).
- Total soluble solids (TSS %): The percentage of TSS in tubers was estimated by hand refractometer according to Cox and Pearson (1962).
- Vitamin C content "Ascorbic acid" (mg/100 g fresh weight). It was determined according to the method reported in AOAC (1990).
- Nitrate (NO_3-N) and nitrite (NO_2-N) determinations in ppm were estimated as described by Singh (1988).

All data of this study statistically analyzed according to the technique analysis of variance for strip-plot design with three replicates (Gomez and Gomez, 1984), using "MSTAT-C" Computer software package. The treatment means were compared using LSD method (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

1- Effect of Potassium Fertilizer Levels:

As shown from data presented in Tables 2 and 3, the effect of potassium fertilizer levels *i.e.* 100, 75 and 50 % of the recommended dose (96.0, 72.0 and 48.0 kg K_2O/fed, respectively) on vegetative growth characters after 90 days from planting (plant height, number of leaves/plant, fresh weight/plant and dry matter percentage of plant and tubers), yield (total marketable tubers yield/fed) and quality parameters of tubers (total carbohydrates, total sugars, starch, total soluble solids "TSS" percentages, Vitamin-C, nitrite and nitrate concentrations in fresh potato tubers) were significant in both seasons, except starch percentage in fresh potato tubers in the first season, which was not significantly affected by studied potassium fertilizer levels.

From obtained results, it could be stated that mineral fertilizing potato plants with 72.0 kg K_2O/fed (75 % of the recommended dose) led to the highest values of vegetative growth characters, dry matter percentage of potato plant and tubers, total marketable tubers yield/fed, total soluble solids percentage (TSS) and Vitamin-C content in fresh potato in both seasons of this study. While, the highest values of total carbohydrates and starch percentages, nitrite and nitrate concentration in fresh potato tubers were obtained from fertilizing potato plants with 96.0 kg K_2O/fed (100 % of the recommended dose) in the two seasons. Conversely, the lowest values of all studied characters (vegetative growth characters, yield and quality parameters of tubers) were resulted from fertilizing potato plants with 48.0 kg K_2O/fed (50 % of the recommended dose), except total sugars percentage in fresh potato tubers, which had reverse trend of the entire studied characters in mutually seasons.

The positive effect on vegetative growth characters of potato due to fertilizing potato plants with 75 % of the recommended potassium dose may be ascribed to the antagonism among potassium and other beneficial elements such as magnesium, where potassium exceeded in the soil solution render magnesium absorption when 100 % of the recommended dose was added, moreover potassium quantity presented in the soil shown in Table 1, and consequently the photosynthates decreased. In addition, the potential benefits of providing potato plants with sufficient potassium is necessary to provide optimal plant growth performance, promoting early plant maturity, tissue strength, resistance to diseases and other pests, and consequently improving growth, total marketable tubers yield and quality parameters. These results came in the similar point of view with those reported by Razaq *et al.* (2015), Shunka *et al.* (2016), Zelelew *et al.* (2016), Abou Zeid and Abd El-Latif (2017) and Shunka *et al.* (2017).

2- Effect of Foliar Application Treatments:

Obtained results show that studied foliar application treatments *i.e.* without foliar spraying (control treatment), foliar spraying with commercial fertilizers *i.e.* KTS (as a source of potassium and sulphur), MegaPot (as a source of nitrogen, potassium and sulphur) and potassium sulphate (as a source of potassium and sulphur) significantly affected vegetative growth characters after 90 days from planting (plant height, number of leaves/plant, fresh weight/plant and dry matter percentage of plant and tubers), yield (total marketable tubers yield/fed),) and quality parameters of tubers (total carbohydrates, total sugars, starch, total soluble solids "TSS" percentages, vitamin-C, nitrite and nitrate concentrations in fresh potato tubers) in both seasons as shown from data showed in Tables 2 and 3 were also responded to foliar application K sources

There were substantial differences in vegetative growth characters, yield and quality parameters of tubers among all foliar application treatments and control treatment in both seasons. Foliar spraying potato plants four times after appearing the second true leaves and regularly after two weeks with commercial fertilizer (MegaPot as a source of nitrogen, potassium and sulphur) at the rate of 1.5 g/liter water exceeded other foliar application treatments and produced the highest values of vegetative growth characters, yield and quality parameters of tubers, except total sugars percentage, nitrite and nitrate concentration in fresh potato tubers in the two seasons. The second best foliar spraying treatment was foliar spraying with potassium sulphate (K_2SO_4 as a source of potassium and sulphur) at the rate of 10 g/liter water in each spraying, then foliar spraying with commercial fertilizer (KTS as a source of potassium and sulphur) at the rate of 2.5 ml/liter water in each spraying in both seasons concerning its effect on vegetative growth characters, yield and quality parameters of tubers in both seasons. Whereas, the lowest values of vegetative growth characters, yield and quality parameters of tubers were obtained from control treatment (without foliar spraying), excluding total sugars percentage, nitrite and nitrate concentration in fresh potato tubers in both seasons. The lowest total sugars percentage, nitrite and nitrate concentration in fresh potato tubers were obtained from foliar spraying potato plants with MegaPot, followed by foliar spraying with KTS, and then foliar spraying with potassium sulphate (K_2SO_4) in both seasons. Potato plants grown without foliar spraying gave the highest total sugars percentage, nitrite and nitrate concentrations in fresh potato tubers in both seasons.

These results may be due to the role of macro nutrients that presented in these commercial fertilizers (nitrogen, potassium and sulphur) in production of some growth regulators such as IAA, which is essential for the elongation of the plant parts. In addition, the desirable effects of nitrogen which considers as one of the major elements which is essential for plant growth and plays an important role in division and elongation of cells, enhancing color and vigor of the leaf canopy, thus increasing cell number and size and also via activation metabolic and photosynthesis processes. Also, the role of potassium in growth of meristematic tissue, maintenance of cell turgor pressure, play a major role in osmoregulation, photosynthesis, transpiration and stomatal opening and closing. Besides, the promotion effect of sulphur on growth which could be attributed to the effect of sulphur for increasing the availability of certain plant nutrient as phosphorous, manganese and zinc, which was reflected on increases in plant growth characters of potato. These results are parallel with those reported by Qadri *et al.* (2015), Ghosh *et al.* (2017) and Moinuddin *et al.* (2017).

3- Effect of Interaction:

The interactions between both studied factors *i.e.* potassium fertilizer levels and foliar application treatments had significant effects on fresh weight/plant, dry matter percentage of plant and tubers, total marketable tubers yield, TSS percentage and vitamin-C content in fresh tubers in both seasons, percentages of total carbohydrates (in the first season), total sugars and starch (in the second season).

The highest values of fresh weight per potato plant, dry matter percentage of potato plant and tubers, total marketable tubers yield, total soluble solids percentage (TSS) and vitamin-C in fresh potato tubers were obtained from fertilizing potato plants with 72.0 kg K_2O/fed (75 % of the recommended potassium dose) in addition to foliar spraying four times with commercial fertilizer (MegaPot) in both seasons as shown from data given in Tables 2 and 3. The highest values of total carbohydrates and starch percentages in fresh potato tubers resulted from fertilizing with 96.0 kg K_2O/fed as well as foliar spraying four times with MegaPot in both seasons. While, fertilizing with 48.0 kg K_2O/fed without foliar spraying with any commercial fertilizers gave the lowest values of these characters in equally seasons.

Table 2. Plant height, number of leaves/plant, fresh weight/plant, dry matter percentage of potato plant and tubers and total marketable yield of potato as affected by potassium fertilizer levels and foliar application treatments as well as their interactions during 2015/2016 and 2016/2017 seasons.

Characters / Treatments		Plant height (cm)		Number of leaves/ plant		Fresh weight/ plant (g)		Dry matter (%) of plant		Dry Matter (%) of tubers		Total marketable tubers yield (t/fed)	
		2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017
A- K-levels:													
100 %		54.83	57.91	19.00	22.16	212.0	225.7	13.68	14.32	14.01	14.28	16.536	17.833
75 %		56.25	58.16	20.75	27.25	235.2	251.9	13.99	14.61	14.36	14.70	16.949	18.202
50 %		54.08	56.00	18.83	21.41	173.8	194.2	13.11	13.75	13.18	13.51	14.780	15.723
LSD at 5 %		1.39	1.53	0.99	0.68	3.1	2.7	0.06	0.06	0.06	0.07	0.260	0.231
B- Foliar application treatments:													
Without		53.88	55.66	18.11	21.44	186.3	204.5	13.30	13.92	13.48	13.74	15.237	16.684
KTS		54.77	56.88	19.77	23.22	206.6	223.8	13.57	14.20	13.83	14.15	15.748	16.950
Megapot		57.00	58.77	20.33	25.55	220.2	234.8	13.78	14.41	14.05	14.40	17.594	18.388
K_2SO_4		54.55	58.11	19.88	24.22	215.0	232.5	13.74	14.37	14.03	14.36	15.774	16.989
LSD at 5 %		1.55	1.53	1.38	1.15	3.8	4.2	0.05	0.07	0.07	0.11	0.367	0.306
C- Interaction*:*													
100 %	Without	53.66	56.66	17.00	20.00	194.3	211.3	13.42	14.05	13.68	13.90	16.410	17.192
	KTS	54.00	57.00	19.33	21.66	212.3	223.3	13.66	14.28	13.98	14.24	16.465	17.317
	Megapot	57.33	60.00	20.00	23.66	225.3	236.3	13.89	14.53	14.27	14.57	18.476	19.480
	K_2SO_4	54.33	59.00	19.00	23.33	216.3	232.0	13.78	14.42	14.13	14.41	16.444	17.306
75 %	Without	53.33	55.66	18.66	25.00	202.3	216.6	13.54	14.16	13.81	14.08	16.457	17.513
	KTS	56.33	57.33	21.00	26.66	237.0	256.6	14.01	14.64	14.41	14.75	16.273	17.798
	Megapot	58.66	59.66	21.33	30.00	257.0	271.3	14.27	14.89	14.68	15.07	18.710	19.518
	K_2SO_4	56.66	59.00	22.00	27.33	244.6	263.0	14.15	14.77	14.55	14.93	14.703	18.018
50 %	Without	54.66	54.66	18.66	19.33	162.3	185.6	12.94	13.57	12.97	13.24	14.376	15.346
	KTS	54.00	56.33	19.00	21.33	170.6	191.6	13.04	13.68	13.12	13.48	14.582	15.736
	Megapot	55.00	56.66	19.66	23.00	178.3	197.0	13.18	13.82	13.22	13.57	15.597	16.166
	K_2SO_4	52.66	56.33	18.66	22.00	184.0	202.6	13.29	13.92	13.42	13.74	14.565	15.643
LSD at 5 %		NS	NS	NS	NS	5.0	6.2	0.14	0.11	0.10	0.14	0.710	0.658

Table 3. Total carbohydrates and sugars, starch and total soluble solids (TSS) percentages, vitamin-C content and nitrate and nitrite concentration in fresh potato tubers as affected by potassium fertilizer levels and foliar application treatments as well as their interactions during 2015/2016 and 2016/2017 seasons.

Characters / Treatments		Total carbohydrates(%)		Total sugars (%)		Starch (%)		TSS (%)		Vitamin-C (mg/100g FW)		NO_3-N (ppm)		NO_2-N (ppm)	
		2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017	2015/ 2016	2016/ 2017
A- K-levels:															
100 %		26.35	29.11	4.65	3.99	16.72	18.72	6.73	6.92	20.08	19.77	32.50	32.72	1.473	1.590
75 %		26.28	28.40	4.79	4.36	16.42	17.83	6.93	7.33	20.76	20.40	31.81	32.28	1.379	1.493
50 %		25.93	26.42	4.95	5.07	16.25	16.42	6.30	6.63	19.13	18.36	31.12	31.72	1.290	1.406
LSD at 5 %		0.13	0.25	0.07	0.05	NS	0.10	0.06	0.10	0.19	0.14	0.48	0.43	0.042	0.031
B- Foliar application treatments:															
Without		24.49	27.04	5.46	4.86	14.35	16.87	6.41	6.78	19.40	18.79	34.97	34.77	1.791	1.896
KTS		25.74	27.96	5.03	4.49	16.28	17.62	6.66	6.99	19.97	19.47	32.86	32.72	1.520	1.659
Megapot		27.52	28.54	4.11	4.26	18.04	18.12	6.78	7.14	20.42	19.91	28.61	30.19	0.978	1.070
K_2SO_4		27.00	28.36	4.58	4.29	17.19	18.02	6.77	6.94	20.18	19.86	30.80	31.28	1.234	1.361
LSD at 5 %		0.14	0.21	0.06	0.08	0.14	0.09	0.04	0.11	0.15	0.09	0.23	0.28	0.052	0.043
C- Interaction:															
100 %	Without	24.94	27.85	5.33	4.55	12.60	17.47	6.52	6.87	19.54	19.07	35.70	35.23	1.880	1.990
	KTS	27.36	29.42	4.44	3.94	17.48	18.82	6.71	7.07	20.20	19.72	33.53	33.60	1.613	1.750
	Megapot	28.15	30.07	4.87	3.68	16.59	19.47	6.89	6.59	20.33	20.25	29.30	30.37	1.070	1.177
	K_2SO_4	27.74	29.11	3.96	3.80	18.34	19.15	6.79	7.16	20.27	20.04	31.46	31.70	1.330	1.443
75 %	Without	24.45	27.43	5.44	4.71	15.38	17.18	6.53	6.98	19.86	19.38	34.96	34.86	1.790	1.887
	KTS	27.07	28.24	4.58	4.38	17.19	17.76	6.99	7.35	20.61	20.47	32.86	33.20	1.513	1.663
	Megapot	25.73	28.96	5.03	4.11	16.27	18.35	7.12	7.56	21.74	20.98	28.50	29.83	0.980	1.060
	K_2SO_4	26.15	28.96	4.11	4.25	18.03	18.03	7.07	7.45	20.85	20.75	30.93	31.23	1.233	1.363
50 %	Without	24.08	25.85	5.62	5.31	15.06	15.97	6.17	6.48	18.81	17.93	34.26	34.23	1.703	1.810
	KTS	26.56	26.22	4.72	5.14	16.90	16.28	6.27	6.56	19.10	18.22	32.20	31.36	1.433	1.563
	Megapot	25.33	26.61	5.18	4.99	15.97	16.55	6.32	6.69	19.18	18.51	28.03	30.36	0.883	0.973
	K_2SO_4	26.68	27.02	4.28	4.83	17.75	16.88	6.46	6.80	19.43	18.80	30.00	30.93	1.140	1.277
LSD at 5 %		0.14	NS	NS	0.14	NS	0.14	0.07	0.15	0.28	0.15	NS	NS	NS	NS

CONCLUSION

It can be accomplished that mineral fertilizing potato by 72.0 kg K_2O/fed (75 % of the recommended dose) as a soil application in addition foliar spraying four times with commercial fertilizer MegaPot (as a source of nitrogen, potassium and sulphur) at the rate of 1.5 g/liter water in each spraying is the best to obtain high growth, yield, chemical composition and quality of potato Spunta cultivar.

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استجابة نباتات البطاطس لمصادر ومعدلات التسميد البوتاسى

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نفذت تجربتان حقليتان بحقل خاص بقرية ميت حبيب ، محافظة الغربية ، مصر، خلال موسمي 2016/2015 و 2017/2016 لدراسة تأثير مستويات السماد البوتاسى ومعاملات الرش الورقى على النمو والمحصول وصفات الجودة للبطاطس صنف سبونتا. استخدم تصميم الشرائح المتعامدة المنشقة في ثلاث مكررات. وقد خصصت الشرائح الرأسية لمستويات السماد البوتاسى. بينما خصصت الشرائح الأفقية لمعاملات التسميد الورقي ويمكن تلخيص النتائج التي تم الحصول عليها على النحو التالي:أظهرت النتائج المتحصل عليها أن التسميد المعدني لنباتات البطاطس بـ 75٪ من المعدل الموصى به من السماد البوتاسى سجل أعلى القيم لصفات النمو الخضري، النسبة المئوية للمادة الجافة في نباتات البطاطس والدرنات، إجمالي محصول الدرنات القابلة للتسويق / فدان، النسبة المئوية للمواد الصلبة الذائبة الكلية ومحتوى الدرنات الطازجة من فيتامين ج في كلا موسمى الدراسة. في حين تم الحصول على أعلى قيم لصفات النسبة المئوية للكربوهيدرات الكلية والنشا ومحتوى الدرنات الطازجة من النترات والنتريت عند تسميد نباتات البطاطس بـ 100٪ من المعدل الموصى به من السماد البوتاسى في كلا الموسمين.أدى الرش الورقى لنباتات البطاطس أربع مرات بعد ظهور الورقة الحقيقية الثانية وبصفة منتظمة كل أسبوعين بالسماد التجاري MegaPot كمصدر للنيتروجين والبوتاسيوم والكبريت بمعدل 1.5 جم / لتر ماء فى كل رشة للحصول على أعلى القيم لصفات النمو الخضري، المحصول وصفات جودة الدرنات، باستثناء النسبة المئوية للسكريات الكلية، محتوى الدرنات الطازجة من النترات والنيتريت في الموسمين الأول والثاني من هذه الدراسة. كما نتجت أقل نسبة مئوية من السكريات الكلية ومحتوى النترات والنيتريت في الدرنات الطازجة عند الرش الورقى لنباتات البطاطس بالسماد التجاري MegaPot ، يليه الرش الورقى بالسماد التجاري KTS ، ثم الرش الورقى بسلفات البوتاسيوم (K_2SO_4) في كلا الموسمين. وقد أعطت نباتات البطاطس المنزرعة بدون رش ورقى أعلى نسبة مئوية من السكريات الكلية ومحتوى النترات والينتريت في الدرنات الطازجة في كلا الموسمين.من نتائج هذه الدراسة ، يمكن التوصية بالتسميد المعدني بمعدل 75٪ من المعدل الموصى به من السماد البوتاسى كإضافة أرضية مع الرش الورقى أربع مرات بالسماد التجاري MegaPot (كمصدر للنيتروجين والبوتاسيوم والكبريت) بمعدل من 1.5 جرام / لتر ماء في كل رشة للحصول على أفضل نمو ومحصول وجودة لدرنات البطاطس صنف أسبونتا تحت الظروف البيئية بمحافظة الغربية ، مصر.