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Response of New Potato Cultivars to Different Levels of Potassium Application under Egyptian Conditions

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THE RELEASE of four new potato (*Solanum tuberosum* L.) cultivars namely Eden, Hermine, Soleia and Safrane into the Egyptian agricultural system, necessitates the development of appropriate potassium fertilizer recommendations.These new cultivars in comparison with common grown cultivar Diamant, were treated with four potassium levels, *i.e.*, 60, 80 ,100 and 120 kg K_2O per fed., in the form of potassium sulfate (48%). Each of the five cultivars showed different response to potassium application treatments. The highest plant height, number of leaves and stems as well as number of tubers and its quality were obtained by Eden cultivar. In comparison to other K_2O rates, all cultivars showed similar trends to the highest K_2O rate where the highest plant height, number of tubers, tuber yield were recorded. Total carbohydrates (%), dry matter content (%) and starch increased significantly only with 120 kg of K_2O/fed. The interaction between cultivar and potassium rate resulted in increasing vegetative growth, yield and improving quality of potato tuber. The highest and lowest interactions were recorded with cultivars Eden and Soleia treated with 120 and 60 Kg K_2O respectively.

Kewwords: Potato (*Solanum tuberosum* L.), Cultivars, Potassium application, Quality and yield.

Potato (*Solanum turberosum* L.) is one of the major crops contributing to the world's food requirement. It has a high biological value because it is a rich source of starch and having the protein of high biological value (Eppendorfer and Eggum, 1994). In Egypt, potato occupies 200.000 feddan (4200m^2) with a total production of 2 million tons. The French potato cultivar development program released many new cultivars, *i.e.* Solia, Safrane, Hermine and Eden. Each cultivar has morphological and developmental characteristics that differ from the common grown cultivar Diamant. Eden is late maturing, mean while Solia, Safrane and Hermine are early maturing cultivars. On the other hand Diamant is medium maturing cultivar.

Consequently each cultivar has unique K fertilizer requirements. Potassium acts as a somaticum in plants, and is a basic element necessary for translocation of sugars and synthesis of starch (Westermann *et al.*, 1994). Therefore potassium is considered as an integral component of the balanced fertilization of potato crop to improve yield as well as quality of the tuber (Tandon and Sekhon, 1988).

Potassium nutrition increases the average size of the tuber significantly (Oktay *et al.*, 1997) which accordingly could get reflected on enhanced aggregate yield (Sud and Grewal, 1992). This study aimed to find out the optimum potassium fertilizer requirement of five potato cultivars under Egyptian growing conditions.

Material and Methods

Two experiments were performed at International Potato Center (CIP) farm at Kafr EL-Zayat, Gharbia Governorate, during the two successive seasons 2005 and 2006. These experiments were conducted to evaluate new potato cultivars, namely Hermine, Safrane, Eden and Solia with the standard cv. Diamant under Egyptian Conditions. The new cultivars Safrane, Eden, Solia, Hermine were imported from France through General Authority for Producers and Exporters of Horticulture Crops while cv. Diamant was imported from Holland. The whole potato seed tubers were planted on 16^{th} of January in the two seasons. Potato seed tubers were planted at distance 25 cm between plants and 75 cm between rows.

These experiments included twenty treatments which were the combinations of five potato cultivars and four different levels of potassium (K_2O), *i.e.* 60, 80, 100 and 120 kg of K_2O/Fed. The design of the experiments was split plot with three replications. The cultivars were in the main plots and the fertilizer treatments of potassium were in the sub plots. The plot area was 9.6 m^2 consisted of four inner rows of 3 m in length and 80 cm in width.

The amount of potassium was added as side dressing in two equal doses after 45 and 65 days after planting in the form of Potassium Sulfate (48 %). Other agricultural treatments for potato production were performed as recommended by the Ministry of Agriculture in Egypt.

A random sample of ten plants was taken from each plot at 75 days after planting for the determinations of vegetative growth, *i.e.*, plant height, number of leaves and stems and fresh and dry weights of haulm. Each experimental plot was harvested 120 days after planting and average tuber weight, number of tubers/plant and total yield were recorded. Plant leaf samples were collected at 80days after planting by collecting the fourth fully expanded leaves and analyzed for N, P and K content. Total nitrogen and potassium contents were determined according to the procedure described by FAO Soils Bulletin (1980) and phosphorus was determined by the method described by Chapman and Prat (1961).

A random sample of 30 tubers were selected from each experimental unit then washed, dried and cut into small pieces, which were mixed and grounded for the determination of starch in tubers. Tuber specific gravity was calculated from samples weights measured in air and water. Dry matter content was determined by drying at 65C° for 72 hours. Starch was determined according to the method of Luff-Schoorl that proceeds by acid hydrolysis of starch and titration by sodium thiosulphate (A.O.A.C.,1975). All data were subjected to statistical analysis according to the procedures reported by Snedecor and Cochran (1982) and means were compared by Duncan's multiple range tests at 5% level of probability in the two seasons of experimentation.

Results

Vegetative growth

The comparisons among the mean values of the vegetative growth of potato cultivars showed significant difference, Eden cultivar is characterized with the highest mean values for plant height, number of stems and leaves and fresh and dry weights of haulm than those of Safrane, Hermine, Soleia and Diamant cultivars in first season. Eden and Safrane cultivars were not significantly different from each other in recorded vegetative growth in second season as shown in Table 1.

Increasing levels of potassium application from 60 to 120 kg of K_2O per fed caused increment in vegetative growth of plant, i.e., plant height, fresh and dry weights of haulm. The highest values of theses parameters were recorded with the application of 120 kg of K_2O per fed.

The interaction between cultivars and potassium levels was significant for all tested characters of vegetative growth. The highest values were recorded with cv. Eden treated with 120 kg of K_2O per fed, whereas the lowest values were recorded by cv. Soleia fertilized with 60 kg of K_2O per fed respectively in both growing seasons (Tables 2, 3).

Yield and quality

Data presented in Tables (4, 5 and 6) showed that cvs. Eden and Safrane proved superior with highest mean values for total yield, number of tubers per plant compared with those of cvs. Hermine, Soleia and Diamant in the first season. Meanwhile, Eden, Safrane and Diamant cultivars gave the highest values for total yield, number of tubers per plant compared with those of Hermine and Soleia cultivars in the second season.

Potassium played an important role on yield and quality. Increasing rate of potassium fertilizers up to 120 kg of K_2O per fed had positive effect on number of tubers per plant and average tuber weight which were reflected positively on total yield in both seasons as shown in Table 2.

Tables 4, 5 and 6 show some quality parameters. Dry matter content, specific gravity, starch and total carbohydrates varied significantly among the tested potato cultivars. Eden and Safrane cultivars gave the highest percentage of those parameters.

The interaction between potato cultivars and potassium fertilization levels significantly affected the percentage of yield and quality. Applying potassium to the soil at 120 kg of K_2O per fed with Eden cultivar resulted in the highest value of yield and quality. On the other hand results indicated that the lowest value of yield and quality was with Soleia cultivar which received 60 kg K_2O per fed in both growing seasons.

TABLE 1. Effect of new cultivars and potassium application cultivars on vegetative growth of potato plant in 2005 and 2006 seasons .

Treatments	Plant height (Cm)	No. of leaves /plant	No. of stems /plant	F.W. of leaves (g /plant)	F.W. of stems (g /plant)	D.W. of leaves (g /plant)	D.W. of stems (g /plant)
Cultivars	**First season**						
Soleia	63.2 B	49.0 D	3.7 B	209.5 C	70.4 C	11.6 C	7.7 D
Safrane	65.1 BC	54.0 C	3.6 B	258.4 A	73.9 B	13.8 A	8.4 C
Hermine	63.2 C	50.6 D	3.8 B	214.6 BC	68.8 C	12.0 C	7.5 E
Eden	74.2 A	64.7 A	4.5 A	237.9 AB	81.1 A	13.0 B	10.8 A
Diamant	63.1 C	57.0 B	4.0 AB	232.2 BC	73.3 B	13.2 B	8.8 B
K_2O Kg/fed							
60	63.2 D	50.6 D-	3.1 D-	212.3 D-	70.6 D-	11.6 D-	65.3 D-
80	65.7 C	53.5 C-	3.7 C-	227.4 C-	72.4 C-	12.1 C-	73.9 C-
100	67.9 B	56.6 B-	4.0 B-	233.5 B-	74.4 B-	13.3 B-	74.5 B-
120	70.2 A-	59.5 A-	4.9 A-	248.7 A-	76.6 A-	14.0 A-	74.5 A-
Cultivars	**Second season**						
Soleia	68.4 AB	49.6 E	3.8 AB	217.8 B	73.9 A	11.6 B	7.7 D
Safrane	65.5 B	58.5 BC	3.8 AB	251.2 A	74.5 A	13.8 A	8.4 C
Hermine	66.7 AB	54.5 D	3.5 B	218.0 B	64.5 C	12.0 B	7.5 E
Eden	74.0 A	70.2 A	4.3 A	240.2 AB	75.3 A	13.0 A	10.8 A
Diamant	62.4 B	56.6 C	4.0 AB	239.2 AB	68.0 B	13.2 A	8.8 B
K_2O Kg/fed							
60	63.6 D-	51.2 D-	3.0 D-	216.7 D-	65.3 B-	11.6 D-	8.1 D-
80	66.7 C-	54.7 C-	3.6 C-	227.0 C-	73.9 A-	12.1C-	8.4 C-
100	68.4 B-	59.5 B-	4.2 B-	239.5 B-	74.5 A-	13.3 B-	8.8 B-
120	71.1 A-	66.2 A-	4.8 A-	249.7 A-	74.5 A-	14.0 A-	9.3 A-

Values following by the same letter(s) are not significantly different 5%.

TABLE 2. Interaction effects of new cultivars and potassium application on vegetative growth of potato plant in 2005 season.

Cultivars	K_2O Kg/fed.	Plant height (Cm)	No. of leaves/plant	No. of stems/plant	F. W. of leaves/plant	F. W. of stems/plant	D. W. of leaves/plant	D. W. of stems/plant
Soleia	60	67.53 gh	42.00 m	3.00 fg	191.30 j	66.87 j	10.46 i	7.52 m
	80	67.27 def	47.67 kl	3.67 def	204.60 hij	68.87 hij	11.05 h	7.64 m
	100	68.73 cde	51.67 ij	3.67 def	214.60 fghij	71.90 fg	12.13 f	7.80 l
	120	69.73 bcd	54.67 gh	4.67 abc	227.50 defgh	74.03 ef	13.11 e	8.13 jk
Safrane	60	61.93 hi	49.67 j	2.67 g	227.30 defgh	70.83 gh	12.33 f	8.06 k
	80	64.13 gh	51.67 ij	3.33 efg	259.30 abc	73.00 fg	13.02 e	8.31 hi
	100	65.30 fg	56.00 fg	3.67 def	270.70 abc	75.67 de	14.95 a	8.44 gh
	120	69.43 cd	58.67 de	5.00 ab	276.10 a	76.37 de	15.25 a	9.16 f
Hermine	60	57.33 j	47.00 l	3.00 fg	198.40 ij	65.87 k	11.33 gh	6.93 o
	80	60.50 l	49.33 j	3.67 def	205.60 ghij	68.07 ij	11.59 g	7.21 n
	100	65.83 fg	52.33 hi	4.00 cde	214.30 fghij	69.40 hi	12.16 f	7.61 m
	120	69.30 cd	54.00 ghi	4.67 abc	239.90 cdef	72.17 fg	12.94 e	8.46 gh
Eden	60	71.37 bc	61.00 cd	3.67 def	228.50 defgh	78.87 c	12.19 e	10.10 d
	80	72.30 b	63.00 bc	4.33 bcd	233.00 cdefg	80.00 bc	12.34 f	10.48 c
	100	75.70 a	65.00 bc	5.00 ab	241.70 cdef	81.37 b	13.56 d	11.31 b
	120	77.57 a	70.00 a	5.33 a	248.30 bcde	84.43 a	14.23 bc	11.47 a
Diamant	60	60.07 i	53.67 ghi	3.33 efg	216.10 fghij	70.67 gh	12.14 f	8.25 ij
	80	61.17 i	56.00 fg	3.67 def	222.90 efghi	72.37 fg	12.53 f	8.53 g
	100	64.65 fg	58.00 ef	4.00 cde	237.80 cdef	73.90 ef	13.89 cd	9.19 f
	120	66.57 efg	60.33 de	5.00 ab	251.90 abdc	76.47 d	14.53 b	9.54 e

Values following by the same letter (s) are not significantly different 5%.

TABLE 3. Interaction effects of new cultivars and potassium application on vegetative growth of potato plant in 2006 season.

Cultivars	K_2O Kg/fed.	Plant height (Cm)		No. of leaves/plant		No. of stems/plant		F. W. of leaves/plant		F. W. of stems/plant		D. W. of leaves/plant		D. W. of stems/plant	
Soleia	60	65.13	defg	44.67	h	3.33	bcd	205.60	ef	73.90	b	10.46	l	7.52	k
	80	68.10	bcde	46.00	h	3.33	bcd	213.90	def	73.99	a	11.05	kl	7.64	jk
	100	70.10	bcd	50.67	g	4.33	abc	224.00	bcdef	74.50	a	12.13	hij	7.80	j
	120	70.47	bcd	57.33	d	4.33	abc	227.60	bcdef	74.57	a	13.11	efg	8.13	hi
Safrane	60	62.30	fg	50.67	g	3.00	cd	229.70	abcdef	65.30	h	12.33	ghi	8.06	i
	80	62.07	fg	53.67	efg	3.33	bcd	251.10	abcd	73.99	de	13.02	efgh	8.32	fgh
	100	65.50	def	64.00	bc	4.00	abc	255.10	abc	74.50	cde	14.95	ab	8.44	fg
	120	72.77	b	66.00	bc	5.00	a	268.70	a	74.57	cde	15.25	a	9.17	e
Hermine	60	64.10	efg	47.00	h	3.00	cd	198.70	f	68.06	g	11.33	jkl	6.93	m
	80	67.10	cdef	54.00	ef	3.33	bcd	213.50	def	73.09	e	11.59	ijk	7.22	l
	100	66.90	cdef	52.33	fg	4.00	abc	226.10	bcdef	75.31	bcde	12.16	hij	7.61	jk
	120	68.77	bcde	64.67	bc	5.00	a	233.80	abcdef	84.16	a	12.94	fgh	8.46	fg
Eden	60	68.20	bcde	63.00	c	3.33	bcd	224.90	bcdef	64.50	h	12.19	ghij	10.10	c
	80	71.60	bc	66.33	b	4.33	abc	233.00	abcdef	70.13	fg	12.34	ghi	10.48	b
	100	77.53	a	75.00	a	4.33	abc	245.00	abcde	72.60	ef	13.56	def	11.31	a
	120	79.10	a	76.67	a	5.33	a	257.90	ab	74.90	bcde	14.23	bcd	11.47	a
Diamant	60	59.83	g	50.67	g	3.33	bcd	216.90	cdef	73.20	ef	12.14	hij	8.25	ghi
	80	61.57	fg	53.67	efg	4.00	abc	231.60	abcdef	74.27	de	12.53	ghi	8.53	f
	100	63.27	efg	55.67	de	4.33	abc	247.70	abcd	76.37	bcd	13.89	cde	9.19	e
	120	65.30	defg	66.67	b	4.67	ab	260.50	ab	77.40	bc	14.53	abc	9.54	d

Values following by the same letter (s) are not significantly different 5%.

TABLE 4. Effect of new cultivars and potassium application on yield and quality of potato plant in 2005 and 2006 seasons.

Treatments	No. of tuber/ plant	Average tuber weight g/plant	Total yield ton/fed.	Dry matter%	Total carbohydrates %	Specific gravity (g /cm^3)	N	P	K
							% content in leaves		
cultivars	**First season**								
Soleia	6.3 A	94.5 E	13.1 C	19.76 E	40.2 D	1.041 B	3.7 C	0.291 D	6.83 AB
Safrane	6.3 A	125.3 B	17.8 A	22.0 B	48.5 B	*1.074 A*	3.9 B	0.389 B	6.74 B
Hermine	5.5 B	116.1 C	16.7 B	21.9 C	46.6 C	1.063 AB	3.4 C	0.320CD	6.08 D
Eden	6.4 A	132.0 A	18.1 A	22.8 A	53.1 A	1.087 A	4.6 A	0.467 A	7.06 A
Diamant	6.0 A	108.3 D	17.6 AB	21.0 C	46.7 C	1.077 A	3.7 C	0.358 BC	6.22 C
K_2O Kg/fed									
60	5.4 B-	112.1 D-	12.5 D-	19.8 B-	40.5 D-	1.056 A-	3.9 C-	0.261 D-	5.56 D-
80	5.6 B-	113.9 C-	16.3 C-	19.1 B-	45.5 C-	1.061 A-	4.0BC-	0.311 C-	6.24 C-
100	6.6 A-	115.9 B-	17.3 B-	21.3AB-	43.7 B-	*1.065 A-*	4.0 AB-	0.355 B-	6.78 B-
120	6.8 A-	118.9 A-	18.1 A-	22.8 A-	49.8 A-	1.071 A-	4.1 A-	0.418 A-	7.28 A-
cultivars	**Second season**								
Soleia	7.6 AB	102.7 E	13.1 C	19.7 E	40.2 D	1.041 B	3.7 C	0.291 D	6.83 AB
Safrane	7.2 B	136.1 B	17.8 A	22.0 B	48.5 B	*1.074 A*	3.9 B	0.389 B	6.74 B
Hermine	7.0 B	127.3 C	16.7 B	21.9 C	46.6 C	1.063 AB	3.4 C	0.320 CD	6.08 D
Eden	8.2 A	144.3 A	18.1 A	22.8 A	53.1 A	1.087 A	4.6 A	0.467 A	7.06 A
Diamant	7.0 B	121.0 D	17.6 AB	21.0 C	46.7 C	1.077 A	3.7 C	0.358 BC	6.22 C
K_2O Kg/fed									
60	6.6 C-	124.5 B-	16.1 D-	22.4 C-	44.5 D-	1.063 A-	3.76 D-	0.286 D-	5.84 D-
80	6.9 C-	124.1 B-	16.4 C-	22.6 BC-	46.5 C-	1.067 A-	3.86 C-	0.347 C-	6.59 C-
100	7.8 B-	126.6 AB-	16.9 B-	22.8 AB-	48.7 B-	1.07 A-	3.93 B-	0.385 B-	7.04 B-
120	8.4 A-	129.9 A-	17.4 A-	23.1 A-	50.8 A-	1.074 A-	5.97 A-	0.443 A-	7.47 A-

Values following by the same letter (s) are not significantly different 5%

TABLE 5. Interaction effects of new cultivars and potassium application on yield and quality of potato plant in 2005 season.

Cultivars	K_2O Kg/fed.	No. of tuber/ plant		Average tuber weight g/plant		Total yield ton/fed.		Dry matter %		Total carbohydrates %		Specific gravity (g /cm^3)		N		P		K	
														% content in leaves					
First season																			
Soleia	**60**	5.33	bcd	428.70	r	12.56		19.37	g	38.33	l	1.08	ab	3.79	efg	0.19	i	4.72	i
	80	6.33	abcd	455.70	p	16.32	def	19.42	g	38.97	l	1.09	ab	3.82	efg	0.27	fghi	5.30	hi
	100	6.67	abc	458.30	o	17.32	c	19.89	g	41.54	j	1.09	ab	3.86	def	0.29	efgh	6.31	efg
	120	7.00	ab	471.70	m	18.10	b	20.38	g	43.39	hi	1.09	a	3.90	cdef	0.34	cdefg	6.80	cdef
Safrane	**60**	5.00	cd	508.00	l	14.59	j	21.25	cde	42.34	ij	1.08	abc	4.04	bcd	0.31	efgh	5.84	fgh
	80	5.67	abcd	515.00	k	15.79	g	21.48	cde	44.40	gh	1.08	abc	4.07	bc	0.34	cdefg	6.56	defg
	100	7.33	a	517.30	j	16.03	fg	21.68	cd	46.99	ef	1.08	abc	4.11	b	0.38	bcde	7.10	cde
	120	7.33	a	519.30	i	16.30	ef	21.96	bc	48.35	cd	1.08	abc	4.13	b	0.44	abc	7.68	abc
Hermine	**60**	4.67	d	378.30	t	12.25	l	20.13	ef	40.42	k	1.04	abc	3.57	h	0.23	hi	5.30	hi
	80	5.00	cd	411.30	s	12.96	h	20.33	f	42.79	i	1.05	abc	3.57	h	0.29	efgh	5.74	gh
	100	5.67	abcd	436.70	q	14.37	j	20.49	f	44.07	gh	1.05	abc	3.59	h	0.33	defg	5.94	fgh
	120	6.67	abc	468.00	m	16.71	d	20.53	def	47.67	de	1.06	abc	3.65	gh	0.36	bcdef	6.44	efg
Eden	**60**	6.00	abcd	619.00	d	13.07	h	22.84	bcd	46.19	f	1.02	c	4.79	a	0.33	bcdef	6.67	defg
	80	5.33	bcd	654.00	c	17.45	c	23.07	ab	49.07	c	1.03	bc	4.85	a	0.35	bcd	7.44	bcd
	100	7.33	a	668.70	b	17.90	b	23.28	a	51.36	b	1.04	abc	4.89	a	0.42	ab	8.07	ab
	120	7.00	ab	682.30	a	18.79	a	23.75	a	52.68	a	1.06	abc	4.97	a	0.52	a	8.51	a
Diamant	**60**	6.00	abcd	541.70	h	15.81	g	20.70	f	41.67	j	1.06	abc	3.66	gh	0.25	ghi	5.29	hi
	80	5.67	abcd	550.00	g	16.16	efg	20.24	ef	42.62	ij	1.07	abc	3.74	fgh	0.31	efgh	6.17	efgh
	100	6.00	abcd	556.70	f	16.48	de	20.89	def	44.69	g	1.07	abc	3.88	cdef	0.36	bcdef	6.49	defg
	120	6.67	abc	574.70	e	18.27	b	21.66	cdef	46.40	f	1.07	abc	3.95	bcde	0.43	bc	6.97	cde

Values following by the same letter (s) are not significantly different 5%.

TABLE 6. Interaction effects of new cultivars and potassium application on yield and quality of potato plant in 2006 season.

Cultivars	K_2O Kg/fed.	No. of tuber/ plant		Average tuber weight g/plant		Total yield ton/fed.		Dry matter%		Total carbohydrates %		Specific gravity (g /cm^3)		N		P		K	
														% content in leaves					
Second season																			
Soleia	**60**	6.67	gh	442.70	m	12.80	h	19.22	k	40.76	m	1.03	b	3.66	fg	0.20	i	5.03	h
	80	7.33	efg	448.70	l	12.81	h	19.74	jk	41.66	m	1.04	ab	3.68	fg	0.29	fghi	5.63	g
	100	8.00	cde	450.30	k	13.29	h	19.82	jk	44.32	kl	1.04	ab	3.72	f	0.31	efgh	6.72	e
	120	8.67	bc	465.00	i	13.69	h	20.26	j	46.29	hij	1.06	ab	3.76	ef	0.36	cdefg	7.23	c
Safrane	**60**	6.33	h	502.00	h	16.69	efg	22.73	cdef	45.21	jk	1.08	ab	3.90	de	0.33	efgh	5.84	g
	80	6.67	gh	513.00	g	17.78	bcde	22.92	cde	47.37	gh	1.08	ab	3.92	d	0.36	cdefg	6.94	cde
	100	7.67	def	517.70	f	18.12	b	22.17	bcd	50.16	ef	1.07	ab	3.96	d	0.40	bcde	7.56	b
	120	8.33	bcd	525.00	e	18.33	b	22.45	bc	51.59	cd	1.07	ab	3.98	d	0.46	abc	7.93	a
Hermine	**60**	6.33	h	308.70	t	16.23	g	20.84	i	43.17	l	1.05	ab	3.44	i	0.24	hi	5.64	g
	80	6.67	gh	322.70	s	16.49	fg	20.91	i	45.80	ij	1.06	ab	3.46	hi	0.31	efgh	6.12	f
	100	7.33	efg	335.30	r	17.01	defg	20.02	i	46.91	ghi	1.07	ab	3.53	ghi	0.35	defg	6.32	f
	120	8.00	cde	353.70	q	17.36	cdef	20.13	hi	50.89	de	1.07	ab	3.52	ghi	0.38	bcdef	6.82	de
Eden	**60**	7.00	fgh	612.30	d	17.57	bcde	23.00	cde	49.34	f	1.09	ab	4.29	c	0.39	bcdef	7.07	cd
	80	7.33	efg	622.70	c	17.61	bcde	23.03	ab	52.39	c	1.09	ab	4.67	b	0.45	bcd	7.60	b
	100	9.00	ab	630.70	b	17.99	bcd	23.34	a	54.80	b	1.09	a	4.72	b	0.48	ab	7.91	a
	120	9.67	a	647.00	a	19.49	a	23.63	a	56.23	a	1.08	ab	4.79	b	0.56	a	8.15	a
Diamant	**60**	6.67	gh	415.70	p	17.23	cdefg	21.44	defg	44.48	k	1.07	ab	3.53	ghi	0.27	ghi	5.64	g
	80	6.67	gh	436.70	o	17.60	bcde	21.74	ghi	45.49	jk	1.07	ab	3.61	fgh	0.33	efgh	6.68	e
	100	7.00	fgh	446.00	m	17.78	bcde	21.93	fgh	47.71	g	1.08	ab	3.75	ef	0.38	bcdef	6.74	c
	120	7.67	def	457.00	j	18.13	bc	22.10	efg	49.19	f	1.08	ab	3.81	a	0.46	bc	7.23	c

Values following by the same letter(s) are not significantly different 5%.

N, P and K concentrations in leaves

It is clear from Tables 4, 5 and 6 that the leaves of Eden cultivar had the highest values in plant concentrations of N, P and K while Hermine cultivar had the lowest concentrations.

Increasing rate of potassium significantly caused increment in N, P and K content in the leaves. The rate of 120 kg of K_2O per fed caused significant increment in N, P and K content in leaves in the first season, while 100 and 120 kg of K_2O per fed were not significantly different from each other in second season as shown in Table 2.

The interaction of cultivars and potassium fertilization on nutrient content in potato leaves indicated that Eden cultivar which received 120 Kg of K_2O per fed gave the highest value of N, P and K content, while Hermine cultivar treated with 60 kg of K_2O per fed gave the lowest value in the two seasons (Tables 5, 6).

Discussion

The response of various potato cultivars to fertilization treatments vary according to their genetic potential. The detected differences among the five potato cultivars could be attributed to their genetic features (Dogras *et al.*, 1988)

Potato crop is a heavy remover of soil potassium, so application of potassium fertilizer is very important to improve yield and quality of potato tuber. In this study, increasing the rate of potassium fertilizer application enhanced vegetative growth expressed as plant height, fresh and dry weight of haulm. This increment may be due to increasing other growth parameters such as leaf area which resulted in increasing light interception hence, increment in assimilate production and crop growth as reported by Saha *et al.*(2001).

Marschner (1995) reported that increasing potassium application enhanced nitrogen uptake and this may explain the increment in vegetative growth.

Potassium increased the average tuber weight and number of tuber per plant, resulting in high total yield. This effect might be due to the important role of potassium on the energy status of the plant, translocation and storage of assimilates and maintenance of tissue water relations (Marschner, 1995 and Mengel, 1997).

Potassium not only improves yield but also benefits various aspects of quality with increasing potassium application led to increasing number of stems and number of leaves which resulting in increasing promoting synthesis of photosynthates, increment in assimilate production and their transport to the tubers, and to enhance their conversion into starch (Mengel and Kirkby, 1987). Potassium improves the transfer of radiation energy into primary chemical energy in the form of ATP (Mengel, 1997). This energy is required for all synthetic process in plant metabolism, resulting in production of carbohydrates, proteins and lipids, which express the quality of the crops. The high energy

status in crops well supplied with potassium also promotes synthesis of secondary metabolites, like vitamin C (Mengel, 1997) and all of these contributions to the enhancement of tuber quality.

Differences among cultivars might be due to the genetical differences which led to the differences in plant concentration of N, P and K in the two seasons. The interaction effect was mainly dominated by the genetical potential of each cultivar since the response of each of them differed to the same application rate of potassium.

It could be concluded that the total yield and quality of tested potato cultivars were enhanced as rate of potassium fertilizer increased with the superiority of Eden cultivar.

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أستجابة أصناف جديدة من البطاطس لمعدلات مختلفة من التسميد البوتاسى تحت الظروف المصرية

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أجريت الدراسة خلال موسمى ٢٠٠٥-٢٠٠٦ فى المركز الدولى للبطاطس بكفر الزيات – محافظة الغربية لدراسة استجابة اصناف جديدة من البطاطس لمعدلات مختلفة من التسميد البوتاسى على محصول وجودة نبات البطاطس. حيث استخدم أصناف مدخلة حديثا وهى سوليا ، سافران ، ايدن وهيرمن (اصناف فرنسية) مقارنة بصنف دايمونت (صنف هولندى) وتم أضافة البوتاسيوم بمعدلات ٦٠،٨٠،١٠٠و١٢٠كجم K_2O للفدان فى صورة سلفات بوتاسيوم (٤٨%) وقد أظهرت النتائج تفوق صنف ايدن فى طول النبات، وزن الطازج والجاف للمجموع الخضرى ، زيادة عدد الدرنات النبات الواحد، المحصول الكلى ، وزيادة محتوى الدرنات من النشا ومحتوى الأوراق من العناصر الغذائية مقارنة بباقى الأصناف . وقد أدى المستوى العالى من البوتاسيوم الى زيادة معنوية فى طول النبات، وزن الطازج والجاف للمجموع الخضرى وزيادة عدد الدرنات للنبات الواحد. كما ان أضافة البوتاسيوم أدى الى زيادة معنوية فى المادة الجافة والنشا فى الدرنات والمحصول الكلى. كما أعطى صنف ايدن والذى سمد بأعلى معدل تسميد من السماد البوتاسى أفضل نتائج للتفاعل بين الاصناف ومعدلات التسميد البوتاسى. بينما اظهر كلا من صنفى هيرمن ودايمونت اللذان سمد بأقل معدل تسميد من السماد البوتاسى أقل نتائج للتفاعل بين الاصناف ومعدلات التسميد البوتاسى.