Effect of Potassium Fertilization on Yield and Quality of Some Potato Cultivars

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ABSTRACT: Potato is a cash money crop and plays a crucial role in Egyptian economy, but for its best growth; it demands a good fertilization program as N, P and K. Therefore, this study was conducted to find out the effect of potassium fertilizer levels, in specific, some cultivars on vegetative growth, yield and quality of potato (*Solanum tuberosum* L.). The investigation was conducted in a private farm during the two successive years of 2015 and 2016 in Maghnine village, Kom Hamada, El-Behera Governorate. Each experiment was laid out as split-plot design, with three replications for both seasons. Three cultivars; Spunta, Provento and Galactica were distributed in the main plots, while the potassium levels; 0,50,75 and 100 kg K_2O fed^{-1} were distributed in the sub-plots. The obtained results revealed that there were significant differences in the performance of the tested cultivars, regarding yield and quality parameters especially, cultivar "Galactica" which was found to be more responsive and had high yielding, where it gave the best results in most of the studied parameters. Application of potassium especially at 100 kg K_2O fed^{-1} led to the highest values of plant height (cm), plant yield (g), average of tuber weight (g), total tubers yield (ton fed^{-1}), tubers specific gravity, tubers total and reducing sugars content (%) and tubers starch content (%). Thus, it is, recommended that we should introduce potassium fertilizers to optimize productivity of potato in Egypt.

Keywords: potassium fertilizer, potato cultivars, potato tuber, vegetative and chemical characters, tuber yield and quality

INTRODUCTION

The potato (*Solanum tuberosum* L.) is a herbaceous annual plant that grows up to 100 cm tall and produces tubers. Potato is one of the more often grown crops. Also, ranks as the world's fourth most important food crop, after maize, wheat and rice (Spooner and Bamberg, 1994). Their tubers are a good source of carbohydrates, proteins, vitamins, and minerals in human nutrition (Blagoeva *et al*., 2004). It is a major source of inexpensive energy. It contains high levels of carbohydrate and significant amounts of vitamins B and C and minerals. Moreover, potato is used in many industries, such as French fries, chips and starch (Abdel-Aal *et al*., 1977). In Egypt, potato has an important position among all vegetable crops, where about 20% of the total area of vegetables production is devoted for potato (FAO, 2015). Egypt imports annually from 50000 to 55000 ton of potato seeds from the North West European countries, particularly from Netherland and England to be planted in the summer season in January up to middle of February.

Nevertheless, potato plants require nutrients supply through fertilization due to their shallow root system and high demand of nutrients for tuber's development. For instance, the use of potassium fertilizer is almost negligible in our country which has resulted not only in stagnation of crop yield, but also the quality of the crop. The Ministry of Agriculture of Egypt recorded more than two hundred potato cultivars that are handled in markets. These cultivars are usually subjected for several testes to determine their suitability for farming condition in Egypt. However,

the productivity and economic characteristics of some recently introduced cultivars are much unknown. Therefore, developing a good management practices for potato growers in Egypt was selected and the present research was undertaken to:

i. Evaluate the three potato cultivars for tuber productivity and quality;
ii. Find out the optimal dose of potassium fertilizer in order to improve yields and economical returns to potato growers; and
iii. Examine the interaction effect between cultivars and potassium doses.

MATERIALS AND METHODS

Two field experiments were conducted in a private farm during the two successive summer years of 2015 and 2016, in clay loam soil at Maghnine village located at Kom Hamada, El-Behera Governorate to study the effect of potassium fertilizer levels and some potato cultivars on vegetative growth, yield and quality. The physical and chemical analysis of the soil prior to the initiation of the experiments is shown in Table (1). Certified imported Potato seeds of cultivars Spunta, Provento and Galactica were used after splitting. Cut seedy were planted at the 5th February, in both seasons in dry soil then irrigated. Seeds were planted in two ridges; 0.70 m wide, 6.25 m long and 0.25 m apart between hills on one side of the ridge, making an area of 8.75 m^2 for experimental plot.

Four potassium levels; 0, 50, 75 and 100 kg K_2O fed^{-1} were used. Potassium dosages were applied equally in the form of potassium sulfate (50% K_2O), at 45, 60 and75 days after seed sowing.

The experiments were laid out in split-plot system in randomized complete blocks design (RCBD), with three replications for both seasons. The cultivars were distributed in the main plots, while the potassium levels were distributed in the sub-plots. Data were, statistically, analyzed according to Snedecor and Cochran (1990). The least significant difference (LSD at 0.05) was used to compare the treatment means using CoStat (2005) program. All other agricultural practices for potato production were followed as recommended in the area. Harvesting was accomplished after 110 days of planting during both years.

Recorded data

Vegetative growth measurements

1. **Plant stand:** after complete plant emergence, 45 days after planting, the number of plants plot^{-1} was counted and plant stand percentage was calculated.
2. **Number of main stems plant^{-1}:** it was determined after 45 days of planting, using the average number of main brunches of 10 plants.
3. **Plant height (cm):** it was measured after 75 days of planting, using the average height of 10 plants.

Yield and its components measurements

1. **Average of tuber weight (g)**: it was determined immediately after harvest, by dividing the weight of tubers yield by tuber's number of 10 plants.
2. **The number of tubers plant^{-1}**: it was determined just after harvest using the average number of tubers of 10 plants.
3. **Total tubers yield fed^{-1}:** The yield of the plot was weighed and then converted into tons fed^{-1}.
4. **Average of tuber yield plant^{-1} (g):** It was determined using the average weight of tubers of 10 plants.

Chemicals analysis

1. **Tuber specific gravity:** It was calculated as average of three grades for each treatment according to the methods of (Dinesh *et al*., 2005) by the following formula: Specific gravity = $\frac{Weight\ in\ air}{Weight\ in\ air - Weight\ in\ water.}$
2. **Tuber starch content (%):** It was determined using the method described in (A.O.A.C, 1980) on dry matter basis.
3. **Tuber reducing sugars content (%):** It was determined using 5 g. fresh tuber root, using sulphuric acid and phenol (5%) then colorimetrically determined, according to the method of Dubois *et al*. (1956).
4. **Tuber total sugars content (%):** It was determined using Dubois *et al*. (1956) method on fresh weight basis.

Table (1). The physical and chemical soil properties of experimental site in 2015.

Physical analysis	Sand (%)	24.68
	Silt (%)	35.71
	Clay (%)	39.61
	Texture	Clay loam
Chemical analysis	pH	7.5
	E.C (dS/m)	1.47
	$CaCO_3$	3.25
	O.M (%)	١.٤٤
	Available P (mg/kg)	3.1
Soluble cations (meq L^{-1})	Ca^{++}	1.6
	Mg^{++}	5.0
	Na^{+}	7.4
	K^{+}	0.67
Soluble anion (meq L^{-1})	CO_3^{-}	zero
	$H\ CO_3^{-}$	4
	Cl^{-}	4
	SO_4^{-}	6.8

RESULTS AND DISCUSSION

A. Vegetative growth measurements

1. Plant stand (%)

Table (2) shows that there were no significant differences among cultivars on potato plants stand in both seasons. This finding could be taken place due to the physiological status of the seed tubers and cultivars. It can be noticed from Table (2) that the cultivar "Galactica" tended to increase plant stand (%) than.

Table (2). Effect of potato cultivars, potassium fertilization and their interactions on vegetative measurements of potato plants grown during 2015 and 2016 summer seasons.

Treatments	2015 season	2016 season	2015 season	2016 season	2015 season	2016 season
	Plant stand (%)		Number of stems plant^{-1}		Plant height (cm)	
Cultivar						
Spunta	68.62a	70.09a	1.86a	1.76a	68.62b	70.09b
Provento	70.65a	71.43a	1.80a	1.73a	70.65b	71.43b
Galactica	72.65a	77.46a	1.76a	1.54a	89.11a	88.04a
K_2O (kg fed^{-1})						
Control	69.24a	73.11a	1.81a	1.73a	75.05a	74.21 a
50	69.58a	72.48a	1.83a	1.61a	75.06a	76.22 a
75	70.48a	73.62a	1.76a	1.66a	75.77a	76.72a
100	73.26a	72.76a	1.83a	1.71a	78.63a	78.92a
Interaction	ns	ns	ns	ns	ns	ns

Mean values in the same column marked with the same letter(s) is (are) not significantly different at 0.05 level of probability.
ns= not significant.

The other cultivars, nevertheless this increase did not reach the significant level, during both seasons of the study. In the same context, that there was no such significant difference regarding potato plants emergence among the K_2O application treatments, during both seasons. This finding is in accordance with those of Singh and Lal (2012) and Berisha *et al*. (2014) who stated that plant emergence was not influenced by potassium applied levels. No such significant interaction effects between potato cultivars and Potassium fertilization were noticed to change plant stand % during both season of the presented study.

2. Number of main stems plants^{-1}

Data presented in Table (2) exhibited that number of main stems plants^{-1} was not, significantly, affected among the tested cultivars either in the first or second season. It is worth to be mentioned that all the plants in this study produced less than two stems, which reflected that the used mother tubers were not in a good physiological state. This observation may be arised due to the apical dominance phenomenon (Zaky, 2011). As for the potassium fertilization, there was no such a significant difference among the applied K_2O treatments, during both

seasons of the study. This phenomenon can be noticed because number of main stems plants is a trait related to physiological status of the used tubers and cultivars. Also, number of stems plant^{-1} is a factor dependent variety, seed size and its physiological status; hence, stems per hill were not influenced by potassium levels (Singh and Lal, 2012). El Gamal (1985) who reported that none of N or K levels, significantly affected stem number/ plant of potato cultivars. No such significant interaction effects between potato cultivars and potassium fertilization were noticed to change the number of main stems plant^{-1} during both seasons of the presented study.

3. Plant height (cm)

Table (2) illustrated that the "Galactica" cultivar, significantly, surpassed both "Spunta" and "Provento" cultivars regarding plant height, during both seasons of the study. This result may be attributed to varietal differences. Similar conclusion was reported by Tafi *et al.* (2010). As for potassium fertilization treatments, although it resulted in a gradual increase in plant height, nevertheless, there were no any significant differences among the various tested level of K_2O, including control treatment, during both seasons. On the contrary, Singh and Lal (2012) showed that potassium had significant effect on plant height which, significantly, increased up to 100 kg K_2O/ ha. Meanwhile, the interaction effects between potato cultivars and potassium fertilization concerning plant height was insignificant.

B. Yield and its components

1. Average of tuber weight (g)

Respecting the main effect of cultivars, data of Table (3) exhibited that average tubers weight of potato was, significantly, influenced ($P \leq 0.05$) by the three used cultivars during the both seasons of the study. The cultivar "Galactica" was superior on the other two tested cultivars. Despite there was no significant difference in average tuber weight between cultivar "Provento" and "Spunta". These varietal differences may be due to the differences among the maturity, tuber initiation time, light intersection, the physiological activity, and the ability to accumulate photosynthetically substances (Zaky, 2011). On the other hand, concerning the effect of K_2O fertilization, data claimed that potato average tuber weight, significantly and progressively, increased with increasing K levels. In the first season, maximum and minimum mean values of 154.82 and 110.61 gm per plant were arise from application of 100 kg K_2O fed^{-1} and control, respectively.

Table (3). Effect of potato cultivars, Potassium fertilization and their interactions on yield and its components of potato plants grown during 2015 and 2016 summer seasons.

Treatments	2015 season	2016 season	2015 season	2016 season	2015 season	2016 season	2015 season	2016 season
	Tuber weight (g)		Tubers number plant^{-1}		Plant yield (g)		Total tubers yield (ton fed^{-1})	
Cultivar								
Spunta	115.75b$^{\phi}$	115.29b	7.72ab	7.61c	891.76c	970.54b	13.02 b	13.93c
Provento	127.69b	113.79b	8.23a	9.23a	1039.73b	1043.19b	12.86 b	14.83b
Galactica	152.17a	155.79a	7.31b	8.40b	1197.45a	1303.98a	15.49 a	16.32a
K_2O (kg fed^{-1})								
Control	110.61d	111.66d	7.78a	8.88a	891.85c	946.63c	10.86d	11.83d
50	124.10c	122.38c	7.82a	7.86b	941.45c	1001.06c	12.77c	14.57c
75	137.96b	133.06b	8.1a	8.45a	1104.49b	1171.02b	15.25b	16.12b
100	154.82a	146.06a	7.32a	8.46a	1234.14a	1304.91a	16.28a	17.58a
Interaction	*	ns	ns	ns	ns	ns	ns	ns

$^{\phi}$ Mean values in the same column marked with the same letter (s) is (are) not significantly different at 0.05 level of probability. *= significant ns = not significant.

Similar results were noticed in the second season, Adhikary and Karki (2006) found a sharp response of potato to K_2O application, especially for tuber weight. Many researchers reported that K has desirable effects on potato crop and quality. As for the interaction between the tested cultivars and potassium fertilizer levels, data disclosed that there were significant differences concerning the mean values only during the first season (2015). It was clear that the highest mean value became from cultivar "Galactica" with the level of 100 Kg K_2O fed^{-1}.

2. Number of tubers plant^{-1}

Table (3) revealed that number of tubers plant^{-1} of "Provento" cultivar was, significantly the most pronounced among the tested cultivars as recorded 8.23 in the first season, and 9.23 in the second one. The differences detected between "Spunta" and "Galactica" cultivars, regarding the average of number of tubers plant^{-1} in 2015 season; appeared to be insignificant. Meanwhile, during 2016 season, there was a significant difference between both previous cultivars, where "Provento" cultivar was the first (9.23), "Galactica" cv. recorded the second rank (8.40) and "Spunta" came the third rank (7.61). This result agrees with those of Saluzzo *et al*. (1999); Tekaling and Hammes (2005) who concluded that some cultivars produced the highest total tuber yield when compared with other cultivars. On the other way, none of the tested K_2O levels, during the first season of the study has expressed such significant difference. Meanwhile, in the second season, the control treatment had the highest mean value for number of tubers per plant (8.88). Whereas, the treatment of 50 kg K_2O fed^{-1}; gave the lowest mean value (7.86) trait with significant differences among the other K_2O treatments. On the contrary, El-Gamal *et al.* (1993) reported that insufficient K; results in reduced potato yield and smaller sized tubers. There were no significant differences

regarding the interaction between used cultivars and potassium doses to change number of tubers plant^{-1} during both seasons.

3. Average of tubers yield plant^{-1} (g)

Data in Table (3) disclosed that potato plant tubers yield was significantly (P ≤0.05) affected by used cultivars during both seasons of the study. In the first season, "Galactica" cultivar surpassed the other two cultivars, significantly. It possessed the highest mean value of average tubers yield plant^{-1} (1197.45 g), followed by "Provento" cultivar (1039.73 g) which was also, significantly, surpassed the third cultivar "Spunta". Nevertheless, in the second season, there were also significant differences among the three tested cultivars with the continued of superiority to cultivar "Galactica" (1303.98 g) over the other two cultivars. This result is consistent with that of Abdel-Aal and Imam (1984) who found a wide variation in yield and quality of tubers due to high genetic variability among different cultivars of potato under Assiut conditions. Concerning to the effect of potassium fertilization, the presented data clarified that the potassium levels, significantly, affected tubers yield plant^{-1} during both seasons. Potassium level at 100 kg K_2O fed^{-1} was superior and led to the highest plant yield mean value of tubers yield plant^{-1} (1234.14 g) and (1304.91 g), in 2015 and 2016, respectively. In the same context, Berisha *et al*. (2014) pointed out that potassium fertilizer rate, significantly, affected potato tuber yield. While, the interaction effects between potato cultivars and potassium fertilization respecting tubers yield plant^{-1} was insignificant in both seasons.

4. Total tubers yield ton fed^{-1}

The investigated cultivars declared significant (P ≤0.05) differences in total tubers yield fed^{-1} as shown in Table (3). The cultivar "Galactica" had the highest mean value of total tubers yield ton fed^{-1} during the both seasons of study. The difference in total tubers yield fed^{-1} between the cultivars "Spunta" and "Provento" was not significant in 2015 season, whereas cultivar "Provento" significantly, exceeded cultivar "Spunta" in 2016 season. As for the effect of potassium fertilization, data in Table (3) announced that Potassium application significantly (P ≤0.05) affected total tubers yield fed^{-1} compared with the control. Increasing level of K application up to 100 kg K_2O fed^{-1}, significantly and progressively, increased the total tubers yield fed^{-1}, in both seasons. Razaq *et al.* (2015) revealed that the potash levels had significant effect on potato tubers yield plant^{-1}. It, also, had a significant effect on total tubers yield ha^{-1}. There were no significant differences regarding the interaction effect between used cultivars and potassium doses in both seasons.

C. Chemicals analysis

1. Tuber specific gravity

Based on the main varietal effect on tuber specific gravity, it was found to have significant (P ≤0.05) differences among the varieties evaluated (Table, 4). The highest tuber specific gravity (1.092) and (1.086) was derived from cultivar

"Provento", where "Spunta" cv.; produced the lowest ones (1.064) and (1.064) in 2015 and 2016 seasons, respectively. In a similar study, Abong *et al.* (2010) found that specific gravity and dry matter contents had significant difference among potato varieties. The effect of potassium fertilization on tuber specific gravity was significant and the trend was approximately similar; in both seasons. Application of potassium fertilizer at 100 kg fed^{-1}, significantly, produced the highest tuber specific gravity, in both seasons.

Table (4). Effect of potato cultivars, Potassium fertilization and their interactions on chemicals analysis of potato plants grown during 2015 and 2016 summer seasons.

Treatments	2015 season	2016 season	2015 season	2016 season	2015 season	2016 season	2015 season	2016 season
	Specific Gravity		Tuber's total sugars (%)		Tuber reducing Sugars (%)		Tubers' starch (%)	
Cultivar								
Spunta	1.064b	1.064b	0.907a	0.905c	0.46a	0.45b	14.87a	14.19a
Provento	1.092a	1.086a	0.948a	0.969b	0.50a	0.49a	15.39a	15.21a
Galactica	1.065b	1.067b	1.010a	1.036a	0.50a	0.52a	15.57a	15.23a
K_2O (kg fed^{-1})								
Control	1.061c	1.063c	1.006a	0.978a	0.50ab	0.530a	15.94a	15.38a
50	1.071b	1.070bc	0.904a	0.970a	0.540a	0.510ab	15.07ab	15.22a
75	1.077b	1.075ab	0.959a	0.970a	0.480ab	0.480b	15.24ab	14.83a
100	1.086a	1.082a	0.944a	0.962a	0.430b	0.430c	14.85b	14.07b
Interaction	ns	ns	ns	*	ns	ns	ns	ns

Mean values in the same column marked with the same letter(s) is (are) not significantly different at 0.05 level of probability. ns = not significant. *= significant.

The sole exception was in 2016 season where the difference in tuber specific gravity between 100 and 50 kg K_2O fed^{-1} was not significant. These findings are matching with those reported by Zelelew and Ghebreslassie (2015) who declared that Potassium application had positive significant effect on specific gravity of potato tubers. Concerning the interaction effect between used cultivars and potassium fertilization was not significant, in both seasons (Table 5).

Table (5). Effect of interactions of potato cultivars and potassium fertilization on tubers specific gravity ant total sugars content (%) of potato plants grown during 2015 and 2016 growing seasons.

Treatments		Specific gravity		Tuber's Total Sugars (%)	
Cultivars	Potassium fertilization (K_2O Kg/ fed)	2015 season	2016 season	2015 season	2016 season
Spunta	Control	1.051	1.051	0.832a	0.923ab
	50	1.055	1.059	0.745a	0.875c
	75	1.069	1.067	0.805a	0.859c
	100	1.079	1.079	0.883a	0.962ac
Provento	Control	1.089	1.089	0.816a	1.012ac
	50	1.094	1.088	0.679a	0.949ac
	75	1.083	1.077	0.936a	0.982ac
	100	1.1	1.089	0.768a	0.934ac
Galactica	Control	1.041	1.047	0.879a	0.998ac
	50	1.063	1.062	0.565a	1.087a
	75	1.077	1.081	0.786a	1.069ab
	100	1.077	1.078	0.691a	0.990ac

Mean values in the same column marked with the same letter(s) is (are) not significantly different at 0.05 level of probability.

2. Tubers' starch content (%)

Regarding the main effect of cultivars, data presented in Table (4) exhibited that tuber starch content was not, significantly, affected ($P \leq 0.05$) by tested cultivars during both seasons. Saluzzo *et al*. (1999) and Tekalign and Hammes (2005) reported that potato cultivars differ in their starch contents. The impact of potassium fertilizer levels on tuber starch content was significant, in both seasons. Application of potassium fertilizer at 100 kg K_2O fed^{-1}, significantly, produced the lowest mean value of tuber starch content, whereas, the control treatment, significantly, resulted in the highest mean value of this character, in both seasons. There were significant downs starch content because of increases of potato tubers yield, especially the tubers bigger than 60 mm (Barascu *et al.,* 2015). Concerning the interaction effect between used cultivars and potassium fertilization was not significant, in both seasons.

3. Tuber's total sugars content (%)

The influence of the three tested cultivars on tuber total sugars content, significantly varied between the two seasons (Table 4). In 2015 season, no significant differences in tuber total sugars content among the three tested cultivars. In 2016 season, tuber total sugars content was significantly, remarkable in cultivar of "Galactica" followed by "Provento" and "Spunta", orderly. These results are in accordance with Olsen *et al*. (2005) who revealed that there are four major factors that influence sugar accumulation in potatoes: cultivar, maturity, stress and storage conditions. Respecting the potassium fertilizer effect, data in the same table expressed that there were no significant differences in tubers total

sugars content among the various applied potassium fertilizer levels, including control treatments during both seasons. As about, the interaction effect between the two studied factors on tubers total sugars content of was not significant, in 2015 season, but the reverse was true, in 2016 season. The growing plants of cultivars "Galactica" and "Spunta" fertilized with potassium at 50 kg fed^{-1}, significantly, attained maximum and minimum tuber total sugars content, respectively.

4. Tuber reducing sugars content (%)

Data presented in Table (4) expressed that varietal influence on tuber reducing sugars content was insignificant in 2015, but significant in 2016. Tuber reducing sugars content of cultivars "Provento" and "Galactica" was, significantly, higher than "Spunta" cultivar. Difference between cultivar "Provento" and "Galactica" in tuber reducing sugars content was at par. This result was in parallel with that stated by Trehan *et al.* (2007) who mentioned that "Accent" and "Turbo" cvs.; gave a higher value of total amino acids content and the highest values in reducing, un-reducing and total sugars content of potato tubers. With respective to the main effect of K_2O fertilizer, during the first season (2015), providing the tested potato plants with 50 kg/fed, resulted in the highest mean value of tuber reducing sugars content (0.54 %) despite existence some other insignificant value among the tested treatments, except for those plants fertilized with 100 Kg/fed (0.43 %). But during the second growing season (2016), the control treatment; gave the highest mean value of tubers reducing sugars content (0.53 %) with a significant value with 75 kg/fed (0.48 %) and100 kg/fed (0.43 %), respectively. These results are in harmony with Anon (2000 and 2005) who indicated that K application through potassium sulphate improved specific gravity, chip color score and decreasing the reducing sugars content of 4 processing grade potato varieties. No interaction effects between potato cultivars and potassium fertilization were noticed to change tubers reducing sugars content during both seasons of the study.

CONCLUSIONS

In the light of all the above-mentioned data, it's possible to conclude that: The cultivar "Galactica" treated with the level of 100 kg K_2O /fed; gave the highest mean values of plant height (cm), plant yield (g), tubers average weight (g) and total yield (ton/ fed). The cultivar "Provento" applied with 100 kg K_2O /fed was the best rang of specific gravity. Generally, we could recommend the following:

- Using the potato cultivar "Galactica" especially, for more yield and quality potato production.
- Using the potassium fertilizers as 100 kg K_2O/fed where it recorded the highest mean values of yield and quality.

REFERENCES

A.O.A.C (1980). Official Methods of Analysis, Association of Official Agricultural Chemists, Bed, Washington, D.C.P. 1018.

Abdel-Aal, S. A. and M. K. Imam (1984). Comparative study of yield and quietly characters in Upper Egypt. Survey paper 9th Trienn. Conf. EAPR, Interlaken, Switzerland, pp. 257-58.

Abdel-Aal, Z.S., A. A. Khalf-Alla, M. Al-Shal and M. Abd-al-Qader (1977). Vegetables production "Part 2. Dar. Al-Madboat. Al-Jadida Publisher, Alexandria ،A.R.E. pp. 15-57 (in Arabic).

Abong, G. O., M. W. Okoth., J. K. Imungi and J. N. Kabira (2010). Evaluation of Selected Kenyan Potato Cultivars for Processing into Potato Crisps. Agric. Biol. J. North Amer. 1(5): 886-893.

Adhikary, B. H and K. B. Karki (2006). Effect of potassium on potato tuber production in acid soils of Malepatan, Pokhara. Nepal Agric. Res. J., 7: 42-48.

Anon (2000). Annu. Rep., Kali-und-Salz sponsored project on use of SOP for improving yield and quality of potato. Potash Res. Inst. India, Gurgaon.

Anony (2005). Annu. Rep. Project on Effect of Potassium Sulphate and Murriate of Potash on Potato Varieties used for Chips Processing Institute. (Personal Communication).

Barascu, N., M. Ianosi, M. M. Duda and V. Donescu (2015). The effect of high NPK levels on Potato yield size. Sci. Papers. Series A. Agron., 8: 136-142.

Berisha, D., E. Susaj, N. Bardhi, L. Susaj, V. Havolli, S. Aliu, I. Rusinovci, B. Neziraj and A. Osmanaj (2014). Effect of Potassium fertilization rate on several vegetative and yield characters of Potato (*Solanum tuberosum* L.), grown under two different agro-climatic regions of Kosovo. online International Interdisciplinary Res. J., 4: 62-69.

Blagoeva, V., E. Iliev and E. Nikolova (2004). Potatoes: cultivation, diseases and pests, and storage. Publisher "Enjovche" Sofia. 105 p.

CoStat Ver. 6.311. (2005). Cohort software798 light house Ave. PMB320, Monterey, CA93940, and USA. email: info@cohort.com and Website http://www.cohort.com/DownloadCoStatPart2.htm

Dinesh, N., A. Lee., E. Miltsakaki., R. Prasad., A. Joshi and B. Webber (2005). Attribution and the (non-)alignment of syntactic and discourse arguments of connectives. In ACL Workshop on Frontiers in Corpus Annotation, Ann. Arbor, MI.

Dubois, M., K. A. Gullles., J. K. Hamilton, P. A. Rebers and F. Smith (1956). Colorimetric method of determination of sugars and related substances. Analy. Chem., 28:250-356.

El Gamal, A. M. (1985). Effect of potassium level on potato yield and quality. J. Agric. Sci. Mansoura. Univ., 10 (4): 1478 – 1476.

El Gamal, A. M, A. N. Fayed and A. M. Daoud. (1993). Effect of potassium and zinc applications of leaf analysis, potato yield and seed quality. Minia. J. Agric. Res. And deve. Special issue. Mania first conference for horticulture crops, 19 – 21. Oct. 1993.

FAO (2015). http://www.fao.org/faostat/en/#data/QC.

Olsen, K. S. (2005). The phonology of Mono (SIL International and the University of Texas at Arlington Publications in Linguistics 140). Dallas: SIL International and the University of Texas at Arlington.

Razaq, M., A. Rab, H. Alam, Salahuddin, S. Saud and Z. Ahmad (2015). Effect of potash levels and plant density on potato yield. J. Bio. Agri. Health 5 (13):54-62.

Saluzzo, J. A., H. E. Echeverria, F. H. Andrade and M. Huarte (1999). Nitrogen nutrition of potato cultivars differing in maturity. J. Agron. Crop. Sci., 183: 157-165.

Singh, S. K and S. S Lal (2012). Effect of potassium nutrition on Potato yield, quality and nutrient use efficiency under varied levels of nitrogen application. Pot. J. 39 (2): 155-165.

Snedecor, G.W. and W.G. Cochran (1990). Statistical Methods. 8th Ed. Iowa

Spooner, D. M. and J. B. Bamberg (1994). Potato genetic resources: sources of resistance and systematics. Amer. Pot. J. 71:325-338.

Tafi, M., S. A. Siyadat, R. Radjabi and M. Mojadam (2010). The effect of earthing up on the potato yield in Dezful weather condition. Middle-east J. Sci. Res., 5(5): 392-396.

Tekaling, T. and P.S. Hammes (2005). Growth and productivity of potato as influenced by cultivar and reproductive growth. II. Growth analysis, tuber yield and quality. Sci. Hort., 105: 29-44.

Trehan, S. P. (2007). Efficiency of potassium utilization from soil as influenced by different potato cultivars in the absence and presence of green manure (*Sesbania aculeata*). Adv. Hort. Sci., 21 (3) :156-164.

Zaky, S. A. (2011). Effects of some agricultural treatments on potato tuber characteristics, storability and chipping quality. Ph. D. Thesis. Alex. Univ.

Zelelew, D. Z and B. M. Ghebreslassie (2015). Response of potato varieties to potassium levels in Hamelmalo area, Eritrea J. Plant. Stud., 5 (1): 11-19.

الملخص العربي

تأثير التسميد البوتاسى على محصول وجودة بعض أصناف البطاطس

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أجريت هذه الدراسة في إحدى المزارع الخاصة في قرية مغنين – مركز كوم حمادة – محافظة البحيرة، خلال الموسمين الزراعيين ٢٠١٥ و٢٠١٦، وذلك بهدف دراسة تأثير مستويات مختلفة من السماد البوتاسى على نمو وإنتاجية وجودة بعض أصناف محصول البطاطس. تم اجراء التجربة بنظام القطع المنشقة مرة واحدة في ثلاث مكررات، تم زراعة ثلاثة أصناف من البطاطس هي اسبونتا، بروفنتو، جالاكتيكا، وتم التسميد البوتاسى من خلال أربعة مستويات هي الكنترول (٠)، ٥٠، ٧٥، ١٠٠ كجم من أوكسيد البوتاسيوم (K_2O) للفدان، زرعت الأصناف عشوائيا في القطع الرئيسية، بينما تم توزيع معاملات التسميد البوتاسى عشوائيا في القطع المنشقة.

أهم النتائج المتحصل عليها

- أعطى الصنف "جالاكتيكا" أعلى قيمة لارتفاع النبات.
- أعطى الصنف "بروفنتو" أعلى متوسط لعدد الدرنات لكل نبات.
- أدت زراعة الصنف "جالاكتيكا" والتسميد ب ١٠٠ كجم سلفات بوتاسيوم إلى أعلى متوسط لمحصول النبات الواحد (جم)، أعلى متوسط لوزن الدرنة (جم)، أعلى متوسط للمحصول الإجمالى (طن/فدان).
- أدت زراعة الصنف "بروفنتو" والتسميد ب ١٠٠ كجم سلفات بوتاسيوم إلى الحصول على أعلى نسبة للكثافة النوعية للدرنات.
- احتوت درنات الصنف "جالاكتيكا" على أعلى نسب من السكريات الكلية والمختزلة.
- أدى استخدام التسميد البوتاسى إلى تقليل محتوى الدرنات من السكريات المختزلة.

توصى الدراسة بزراعة صنف جالاكتيكا والتسميد ب ١٠٠ كجم سلفات بوتاسيوم للفدان للحصول على أعلى إنتاجية، وأفضل جودة للدرنات.