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Effect of different sources and levels of potassium fertilization on productivity of peanut grown under sandy soil conditions

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ABSTRACT

Two field experiments were conducted at Ali Moubarak Experimental Farm of the South Tahrir Research Station, Egypt, during summer seasons of 2013 and 2014. The aim of this study is to compare the effect of potassium sources, *i.e.* potassium sulphate (sulphate of potash SOP) and potassium chloride (muriate of potash MOP) both at the rate of 0, 60 and 120 kg K ha^{-1} on growth, yield and quality of peanut under sprinkler irrigation system, as well as soil contents of available-K, soluble chloride and EC after harvesting. The results showed that there were no significant differences between SOP and MOP for plant height, No. of branches plant^{-1}, No. of pods plant^{-1}, pod and seed yield plant^{-1}, 100-pod weight, 100-seed weight, pod, seed and straw yields, shelling percentage as well as oil and protein yield and N, P & K uptake in seeds. Also, potassium sources had no significant effect on soil contents of available K, Cl and EC after harvest. However data note that, applying potassium at the level of 120 kg K ha^{-1} brought about significant increases in the above mentioned parameters except shelling percentage which was not significantly affected by potassium levels. Also soil contents of available-K and soluble chloride were significantly increased by increasing K fertilizer levels, however there was no salinity build up due to potassium fertilization in sandy soils. Most of the studied traits were significantly affected by the interaction between K-sources and K-levels. The interaction treatment of 120 kg K ha^{-1} as (SOP) was found to be the most effective one, and recorded the highest values of seed yield plant^{-1},100-seed weight, pod, seed and straw yields.

Keywords: Sandy soil, SOP, MOP, peanut, growth characters, yield, yield components, quality.

INTRODUCTION

Plants require nutrients for the normal maintenance of their physiological and biochemical processes. The available amount of these elements is often insufficient in soils and must be supplied as fertilizers, essential inputs for the successful crop production. Among the three major nutrients, potassium (K) has a special position as evident by its role in increasing the crop yield (Yadav, *et al.,* 2003 and Read, *et al.,* 2006) by adding tolerance to various biotic and abiotic stresses. Potassium plays a major role in growth and yield as it is involved in assimilation, transport, and storage tissue development (Cakmak 2005). Potassium is the second most absorbed nutrient by the peanut crop (Tasso *et al.,* 2004), and it plays various metabolic functions in plants including photosynthesis, protein synthesis, activation of several enzymes and functioning of the stomata (Hawkesford *et al.,* 2012), and also presents a beneficial effect on nitrogen fixation and translocation of photosynthates from the leaves to the root nodules (Savani *et* *al.,* 1995). In soils with low potassium contents (less than 1.5mmol$_c$L^{-1}), it is expected that the peanut respond expressively to application of K fertilizer.

Sulphate of potash, is commonly favored by the majority of growers in Egypt since its low salt index, nonhygroscopic and chlorine free K-fertilizer in comparison with muriate of potash, that is a cheaper source of K-fertilizer and that requires specific soil physical properties and some arrangements with irrigation to avoid toxic effect of chlorine and soil salinization particularly on long term farming and increasing fertilizer levels.

Debates have been raised on the possibility of applying MOP to satisfy at least part of the growing demand of potash and how safely this K-fertilizer could be used without risk on crop yield and quality and soil conservation under the effect of higher fertilizer levels.

Comparative studies were conducted to illustrate the effect of SOP and MOP in many countries. In Pakistan, Mian *et al.,* (1998) mentioned that both potassium sources SOP and MOP in loam-textured soils had no-significant differences in grain yield of rice- wheat rotation. Ranjha *et al.,* (2002) also found that potassium application from both forms SOP and MOP had a non-significant effect on grains and straw yield of wheat, but chloride concentration increased in both grains and straw by applying K as MOP. In silty clay loam and silt loam, Tariq *et al.,* (2011) reported that grain yield of maize crop was significantly increased with both SOP and MOP over NP alone treated plots (control). Furthermore, results revealed that tissue Cl, S and K contents at silking stage were significantly increased with the addition of their respective fertilizer sources, but no harmful effect of Cl was observed on the growth of maize crop. In China, Shou *et al.,* (2006) concluded that soil concentrations of potassium chloride higher than 50 mg kg^{-1} soil would have a significantly negative effect on the growth of peanut plants. While, in South Dakota, USA, spring wheat showed grain yield increase due to MOP fertilization on soils that tested very high ammonium acetate extractable K. Soil and plant analyses indicated that the yield increases on very high K-testing soils were due to the Cl in the MOP and not to the K (Fixen *et al.,* 1986a). In another experiment, Fixen *et al.,* (1986b) reported a critical wheat plant Cl concentration of 1.5 g kg^{-1} for whole plant at head emergence assured 96% of maximum grain yield and soil Cl levels >43.5kg ha^{-1} (60cm depth) or 75 kg ha^{-1} (120 cm depth) were adequate for near maximum wheat yield. In Egypt, Darwish (2003) revealed that yield components and N, P and K contents of soybean were not significantly affected by potassium sources but seed and straw yields of soybean, fertilized with K_2SO_4, were higher than those treated with KCl. On sandy soil, Ismail (2004) showed that at the end of rotation, the accumulation of total soluble salts (TSS) and chloride ion in the surface layer of soil were less under the sprinkler irrigation than under the drip irrigation due to the high amounts of irrigation water used in sprinkler system, these parameters were not affected by the addition of neither K-forms nor K- rates. Also, available potassium in the soil increased with increasing the addition rate of potassium, either in sulphate or chloride form under both irrigation systems. On the other hand, he found that under sprinkler irrigation system; faba bean, peanut and sesame responded only to K-sulphate application and showed no signification effects with the addition of K-chloride. Under drip irrigation system; faba bean and sesame significantly responded to K- sulphate fertilizer, while K-chloride showed adverse effects on the production of faba bean and sesame crops.

The main objective of the present study is to evaluate the comparative effects of potassium sulphate and potassium chloride on growth, yield and quality of peanut as well as on soil salinity and soil contents of chlorine and available-K under sandy soil conditions.

MATERIALS AND METHODS

The experimental field

Two field experiments were conducted on peanut (*Arachis hypogaea L*. Giza 5) at Ali Moubarak Experimental Farm of the South Tahrir Research Station, Egypt, during the growing seasons of 2013 and 2014. The experimental site represents newly reclaimed sandy soil of El-Bustan area at west of Nile Delta. It is situated at an altitude of 6.7m above mean sea level and is intersected by 31° 02" N latitude and 30° 28" E longitude. These trials were designed to study the effect of two potassium fertilizer sources, *viz*. potassium sulphate (sulphate of potash SOP) 50% K_2O, 42% K and 18% S) and potassium chloride (muriate of potash MOP) 60-62% K_2O 50-52% K and 48% chlorine) at three different levels (0, 60 and120 kg K ha^{-1}) on growth, yield and chemical constituents of the studied crop as well as on soil salinity (EC), available-K and soluble chloride in soil under investigation. Representative soil surface (0-30cm) samples were collected from the experimental field before planting to determine some physical and chemical properties of the soil according to standard methods and procedures described by Chapman and Pratt (1961). Results are shown in Table (1).

Table 1: Soil physical and chemical properties of the experimental site (means of the two studied seasons).

Property	Value	Property	Value
Particle size distribution (%)		Soluble cations (soil past $mmol_c$ L^{-1})	
Coarse sand	34.72	Ca^{++}	1.23
Fine sand	56.38	Mg^{++}	0.54
Silt	5.74	Na^{+}	1.56
Clay	3.16	K^{+}	0.17
Soil texture	*Sandy*	Soluble anions (soil past $mmol_c$ L^{-1})	
Chemical analysis		CO_3^{2--}	0.00
pH (1:2.5, soil: water suspension)	7.83	HCO_3^-	1.18
EC dSm^{-1}(soil paste extract)	0.35	Cl^-	1.65
$CaCO_3$ (%)	3.40	SO_4^-	0.67
Organic matter (%)	0.25	Available N ($mgkg^{-1}$)	10.00
		Available P ($mgkg^{-1}$)	3.80
		Available K ($mgkg^{-1}$)	65.00

The experiments were laid out in a split plot design with four replicates. Each plot had an area of $10.5m^2$ and included five ridges of 3.5m length and

60 cm apart. The applied potassium sources were allocated in the main plots and K-fertilizer levels from the two sources were assigned randomly to sub-plot. Seeds of peanut were sown on the7th and 11th of May in the 1st and 2nd seasons, respectively in hills so as to have plants after thinning spaced at 10-cm apart. Phosphorus was applied before sowing at a rate of 36.40 kg P ha^{-1} as single superphosphate (12.5%P_2O_5, 5.5%P). Nitrogen was applied at a rate of 71.40 kg N ha^{-1}as ammonium sulphate (20.6 % N). Both N- and K-fertilizers were applied in two equal doses, at planting and one month later. Irrigation water was applied each four days by using a sprinkler system.

Harvesting the experimental field

At harvest (130 days after sowing), a random sample of five guarded plants were taken from each sub-plot in the four replications to determine growth attributes, *i.e.* plant height, number of branches $plant^{-1}$,number of pods $plant^{-1}$, weight of pods and seeds $plant^{-1}$ (g). Yield of Pods, seeds and straw (t ha^{-1}) as well as weight of 100 pod and seed (g) was calculated on the basis of the three middle rows.

Shelling percentage was calculated by:

Shelling (%) = (seed yield / pod yield) x 100.

Chemical analysis

Seed samples were dried in a forced oven at 70°C, and then ground and wet digested using concentrated sulfuric acid and the mixture of H_2SO_4 and perchloric acids (1:1) (A.O.A.C. 1990) to determine nitrogen, phosphorus and potassium concentration. Total nitrogen was determined using the standard procedure of Micro-Kjeldahl as described by Black *et al.,* (1965). Phosphorus was determined colourimeterically according to Jackson (1973), while potassium was determined by Flame photometer as described by Chapman and Pratt (1961). Crud protein percent in peanut seeds was calculated by multiplying N% by 6.25 according to Tripath *et al.,* (1971). Oil content for peanut seeds was determined according to A.O.A.C. (1990).

Soil sampling after harvest

Surface soil samples (0-30cm) were collected from each plot after harvesting stage to evaluate soil EC, soluble chloride and available-K. The electrical conductivity (EC) of the saturated extract of soil paste was measured (Richards, 1954). Soluble chloride was determined by titration with silver nitrate according to Jackson (1973).The available-K was extracted by neutral (1N) ammonium acetate and determined by Flame photometer according to Chapman and Pratt (1961).

Statistical analysis

Analysis of variance was computed for each trait as combined means of the two growing seasons according to Snedecor and Cochran (1980) and treatment means were compared using LSD at 5% level of probability.

RESULTS AND DISCUSSION

Peanut growth attributes

Data presented in Table (2), show the effect of different sources and levels of potassium fertilizer and their interaction on growth of peanut plants. Data indicated that all the studied growth characters *i.e.* plant height, number of branches plant^{-1}, number of pods plant^{-1} as well as pod and seed yield plant^{-1} (g) were insignificantly affected by sources of potassium fertilizer. In this concern, Darwish (2003) found that K_2SO_4 and KCl had no significant effect on plant height, number of branches plant^{-1}, number of pods plant^{-1}, pod and seed yield plant^{-1} of soybean.

On the other hand data in the same Table showed significant increases in the studied characters due to K fertilization in favor of the high level of K (120 kg ha^{-1}). These results may be attributed to the high availability of K enhances root development, producing more branching and lateral roots (Egilla, *et al.,* 2001). Moreover, potassium plays an important role in the hormonal balance, influencing the increase in the level of auxin, an important hormone for plant growth (Rubio *et al.,* 2009). A beneficial effect of potassium on growth of peanut was also observed by Hafiz, (2005) who found that application of potassium fertilizer up to75 kg K_2O fad^{-1} significantly increased plant height, number of branches plant^{-1}, number of pods and seeds plant^{-1} and weight of pods and seeds plant^{-1} of peanut. El-Habbasha *et al.,* (2014) showed that increasing potassium fertilizer levels from 30 to 90 K kg ha^{-1} without foliar zinc application significantly increased number of pods and seeds plant^{-1} and weight of pods and seeds plant^{-1} of groundnut, whereas, Almeida *et al.,* (2015) concluded that the application of K at a dose of 120 kg K_2O ha^{-1} resulted in a significant increase in the height of peanut plants. However, Gholizadeh *et al.,* (2012) showed that potassium fertilizer levels (0, 75,150 and 225 kg K_2O ha^{-1}) had no significant effect on plant height of tobacco.

Concerning the effect of K- sources × K- levels interaction on growth characters, data in the same Table clarify that this interaction had no significant effect on all growth characters with the exception of seed yield plant^{-1} (g). The best seed yield (38.98 g plant^{-1}) was obtained by adding the treatment of 120 kg K ha^{-1} as (SOP).

Table 2: Growth attributes of peanut plants as affected by different sources and levels of Potassium fertilization (combined data of two growing seasons 2013 and 2014).

Treatments	Growth attributes				
	Plant height (cm)	**No. of Branches /plant**	**No. of pods /plant**	**Pod wt./plant (g)**	**Seed wt./plant (g)**
K-sources					
SOP	37.77	10.17	34.27	50.92	34.49
MOP	38.49	10.14	33.93	50.81	34.43
LSD at 0.05	N.S	N.S	N.S	N.S	N.S
K-levels (kg ha^{-1})					
00	36.09	9.72	33.31	45.80	30.59
60	37.63	10.02	33.54	51.89	35.07
120	40.68	10.72	35.45	54.90	37.73
LSD at 0.05	1.74	0.38	1.39	3.56	1.81
K-sources x K- levels interaction					
00	36.09	9.72	33.31	45.80	30.59
SOP 60	36.67	10.05	33.01	50.51	33.90
120	40.55	10.75	36.49	56.44	38.98
00	36.09	9.72	33.31	45.80	30.59
MOP 60	38.58	9.99	34.08	53.26	36.24
120	40.81	10.70	34.42	53.36	36.48
LSD at 0.05	N.S	N.S	N.S	N.S	2.56

Peanut yield and its components

Data illustrated in Table (3) show that the influence of the two sources of potassium fertilizer on yield and its components of peanut plants was not significant. This may be due to Cl ions from muriate of potash was highly soluble and mobile in soil during crop growth, which leached down from the root zone with irrigation water, showing that both sources of potassium have similar effect on yield of peanut crop under the conditions of the experiment. These results are in line with the previous work of Mian *et al.,* (1998) and Ranjha *et al.,* (2002) who compared both SOP and MOP in loam- textured soils and found non-significant differences in grain yield of rice-wheat rotation. However, Darwish (2003) noticed that seed and straw yields of soybean were significantly affected by potassium forms, but seed and straw yields of soybean, fertilized with K_2SO_4, were higher than those treated with KCl. Ismail (2004) found that faba bean, peanut and sesame responded only to K-sulphate application and showed no signification effects with the addition of K-chloride under sprinkler irrigation system.

For the effect of potassium levels on yield components data in Table (3) illustrate that, increasing potassium level up to 120 kg K ha^{-1} resulted in significant increases in all the studied yield components except shelling percentage which was not significantly affected by potassium levels. The beneficial effect of potassium fertilization evidenced in the peanut crop was due to the low level of the initial available potassium in the surface soil layer of 0 to 30cm (65mg kg^{-1}) (Table 1), and as a result of K application, the availability of this nutrient in the sorption complex and in the soil solution increased, permitting better absorption of nutrients as evidenced by the nutritional status of the crop, therefore favoring the increase in seed production. The favorable significant effect of K on production is related to its known role in plant nutrition, in many physiological and metabolic processes, including photosynthesis, osmoregulation, transport of nutrients, transport and storage of carbohydrates, nitrogen absorption and synthesis of proteins and starch (Hawkesford *et al.,* 2012 and Raza *et al.,* 2014).These findings are in harmony with those obtained by Hafiz, (2005), El-Habbasha *et al.,* (2014) and Almeida *et al.,* (2015) who noted that potassium fertilization increased the production of grains of peanut grown in rotation with sugarcane, especially at the dose of 120 kg ha^{-1} K_2O. On the other hand, Gashti *et al.,* (2012) found that applying of potassium (0, 30, 60 and 90 kg ha^{-1} from potassium sulfate) had no significant effect on weight of 100- kernels, pods and kernels yield (kg ha^{-1}) as well as shelling percentage while Helmy and Ramadan (2014) found that application of K at increasing rates resulted in increase in shelling percentage.

In respect of K-sources × K- levels interaction, data in Table (3) indicate that this interaction had significant effects on100-seed weight, pod, seed and straw yields (t ha^{-1}) with the exception of 100-pod weight and shelling percentage. The greatest values of 100-seed weight, pod, seed and straw yields were 78.18 (g), 2.23, 1.54 and 4.28 (t ha^{-1}) respectively which were obtained by applying the treatment of 120 kg K ha^{-1} as (SOP) with increments of 22.27, 47.68, 52.48 & 44.11 % over the control (K_0) treatment, respectively. This superiority may be attributed to sulfur existed in SOP, which is a main part in sulfur amino acids of cell protein. These results are in full agreement with those obtained by Ismail (2004) who concluded that peanut grain yield responded only to K-sulphate application at the rate of 60 kg K_2O fed^{-1}. Also Tariq *et al.,* (2011) revealed that maximum grain yield of maize was recorded in the treatment plot receiving150 kg K_2O ha^{-1} from muriate and sulphate of potash in both silty clay loam and silt loam soils.

Table 3: Yield components of peanut plants as affected by different sources and levels of potassium fertilization (combined data of two growing seasons 2013 and 2014).

Treatments	Yield components

	100- pod weight (g)	**100- seed weight (g)**	**Pod yield (t ha^{-1})**	**Seed yield (t ha^{-1})**	**Straw yield (t ha^{-1})**	**Shelling (%)**
K-sources						
SOP	187.97	70.71	1.79	1.22	3.51	67.82
MOP	188.02	70.32	1.78	1.21	3.59	68.10
LSD at 0.05	N.S	N.S	N.S	N.S	N.S	N.S
K-levels (kg ha^{-1})						
00	174.40	63.94	1.51	1.01	2.97	67.02
60	192.10	71.53	1.77	1.19	3.49	67.90
120	197.50	76.07	2.09	1.44	4.20	68.89
LSD at 0.05	9.12	2.36	0.09	0.04	0.22	N.S
K-sources x K- levels interaction						
00	174.40	63.94	1.51	1.01	2.97	67.02
SOP 60	189.70	69.99	1.64	1.10	3.29	67.27
120	199.80	78.18	2.23	1.54	4.28	69.17
00	174.40	63.94	1.51	1.01	2.97	67.02
MOP 60	194.40	73.07	1.90	1.29	3.69	68.52
120	195.30	73.96	1.96	1.34	4.11	68.61
LSD at 0.05	N.S	3.33	0.12	0.06	0.31	N.S

Seed quality

Seed quality comprises several parameters such as oil, protein, nitrogen, phosphorus and potassium contents. The obtained results in Table (4) reveal that there were no significant differences between SOP and MOP for oil and protein contents as well as N, P and K uptake in seeds of peanut. In this concern, Darwish (2003) pointed out that soybean seed N, P and K contents were not significantly affected by forms of potassium fertilizer.

As for the effect of potassium levels on seed quality, data in Table (4) illustrate that, raising potassium levels up to 120 kg K ha^{-1} led to significant increase in oil and protein yields as well as nitrogen, phosphorus and potassium uptake in seeds (kg ha^{-1}). Such beneficial effect of K fertilizer could be attributed to increased nodule size, biomass, nitrogen fixation and N-turnover due to increase in translocation of photosynthates (labeled- ^{14}C-sugars and amino acids) from leaves to the nodules at vegetative stage and enhanced nitrogenase activity (Mengel *et al.,* 1974 and Sprent, 1979). Potassium application has also been reported to improve quality of groundnut (Umar and Bansal, 1997).These results are in full agreement with those obtained by Moursi *et al.,* (1967) who observed that low potassium fertilizers depressed the phosphorus content. They found also that the potassium content in pods of soybean reached its maximum peak at 100 kg of potassium sulphate per feddan. Hagin and Shaviv (1990) reported that the adequate supply of potassium enhances ammonium utilization and thus improves yields. Danial *et al.,* (2006) indicated that N, P and K uptake as well as protein and oil contents in seeds of soybean increased with increasing K rates up to 60 kg K_2O fed^{-1}. Gopal (2012) found that the concentration of K increased with increasing K supply in all parts of groundnut. On the other hand, potassium stress both low and excess deteriorated the quality of groundnut seed by decreasing the concentrations of protein and oil in seeds. Helmy and Ramadan (2014) suggested that the application of K improved the N% and helped in the translocation of N to the seeds. They added that the greatest values of N uptake and protein yield in seeds of peanut were obtained by using 20.8 kg K fed^{-1}.

Regarding the effect of K-sources × K- levels interaction on oil and protein yields as well as nitrogen, phosphorus and potassium uptake in seeds, data in Table (4) demonstrate that this interaction was significantly effective on all chemical constituents in seeds of peanut. The highest values of oil and protein yield, as well as N, P and K uptake in seeds were 716.00, 466.30, 74.61, 7.73 & 9.35 kg ha^{-1} respectively by using the treatment of 120 kg K ha^{-1}as (SOP) which led to increments of 57.64, 55.33, 55.31, 54.29 & 58.21% over the control respectively. Therefore, the addition of 120 kg K ha^{-1} as potassium sulphate may be recommended for peanut plants in order to increase oil and protein yield and nutrients uptake in seeds. The favorable effects of K_2SO_4 on oil, protein yield and N, P & K uptake in seeds may be attributed to the effect of sulphate anion in SOP which improves the use efficiency of such elements leading to increase seed yield of peanut and enhancing the protein and oil contents in crops (Umar *et al.,* 1999).

Table 4: Chemical constituents of peanut seeds as affected by different sources and levels of potassium fertilization (combined data of two growing seasons 2013 and 2014).

Treatments	Chemical constituents				
	Oil content (kg ha^{-1})	**Protein content (kg ha^{-1})**	**N-uptake (kg ha^{-1})**	**P-uptake (kg ha^{-1})**	**K-uptake (kg ha^{-1})**
K-sources					
SOP	561.86	365.71	58.52	6.12	7.29
MOP	551.18	367.04	58.73	6.02	7.30
LSD at 0.05	N.S	N.S	N.S	N.S	N.S
K-levels (kg ha^{-1})					
00	454.20	300.20	48.04	5.01	5.91
60	554.50	358.10	57.29	5.96	7.19
120	660.80	440.90	70.54	7.24	8.78
LSD at 0.05	24.59	20.95	3.35	0.24	0.26
K-sources x K- levels interaction					
00	454.20	300.20	48.04	5.01	5.91
SOP 60	515.40	330.70	52.91	5.61	6.60
120	716.00	466.30	74.61	7.73	9.35
00	454.20	300.20	48.04	5.01	5.91
MOP 60	593.70	385.50	61.68	6.30	7.77
120	605.70	415.50	66.47	6.74	8.22
LSD at 0.05	34.77	29.63	4.74	0.34	0.37

Soil analysis after harvest

Soil surface samples were collected after harvesting the peanut crop in the two growing seasons and were subjected to chemical analysis to follow up the soil contents of available K, soluble chloride (Cl) and electric conductivity (EC) of the soil paste under different K sources and levels.

The obtained data in Table (5) showed no significant differences between SOP and MOP in soil contents of available K, Cl and EC. This could be attributed to the high amount of irrigation water applied with sprinkler system which led to leaching process when irrigation water percolates vertically down the soil profile and there was no salinity build up and no accumulative Cl due to potash fertilization in sandy soils. Similar results were reported by Mian *et al.,* (1998), Ismail (2004) and Tariq *et al.,* (2011).

Table 5: Soil contents of available-K, EC and Cl after peanut crop harvesting as affected by different sources and levels of potassium fertilization (combined data of two growing seasons 2013 and 2014).

Treatments	**Available-K(mg kg^{-1})**			**EC(dSm^{-1})**			**Cl (mmol$_c$L^{-1})**		
K-levels (kg ha^{-1})	**K-sources**								
	SOP	**MOP**	**Mean**	**SOP**	**MOP**	**Mean**	**SOP**	**MOP**	**Mean**
00	57.90	57.90	57.90	0.34	0.34	0.34	1.57	1.57	1.57
60	65.80	67.65	66.73	0.33	0.36	0.35	1.55	1.65	1.60
120	78.55	75.35	76.95	0.37	0.40	0.39	1.64	1.78	1.71
Mean	67.42	66.97		0.35	0.37		1.59	1.67	
LSD at 0.05									
Sources (S)	N.S			N.S			N.S		
Levels (L)	7.08			N.S			0.09		
S×L interaction	N.S			N.S			N.S		

Also, data showed that the extractable NH_4OAc-K was increased significantly by increasing K-fertilizer levels. The available K content increased from 66.73 mg kg^{-1} at 60 kg K ha^{-1} to 76.95 mg kg^{-1} at 120 kg K ha^{-1}. In the meantime, applying higher K-level (120 kg K ha^{-1}) significantly increased the soluble Cl content as compared with those received (60 kg K ha^{-1}) while electric conductivity (EC) was not affected by different applied K levels. It could be concluded that potash fertilization improved the soil available K content and soil-K building up was enhanced by increasing K levels. In this regard, Ismail (2004) found that application of potassium at the rate of 30 or 60 kg K_2O fed^{-1} as SOP or MOP caused increases in available K in soil under both irrigation systems. Also, Tariq *et al.,* (2011) showed that applied K as sulphate or muriate of potash increased the K content over control. Whereas, soluble Cl content in silty clay loam and silt loam soils increased with increasing potassium levels up to 150 kg K_2O ha^{-1} as muriate of potash.

Concerning interaction of the studied fertilizer treatments, data in Table (5) revealed that this interaction had no significant effect on the studied soil parameters.

CONCLUSION

It could be concluded that both potassium sources have almost similar effect on yield of peanut under the conditions of the experiment. This may be due to Cl ions from muriate of potash was highly soluble and mobile in soil during crop growth, which leached down from the root zone with irrigation water. Therefore, MOP may be used as a K-source for such crop on non-saline light textured and fairly well drained soil having adequate irrigation to meet leaching requirements. Soil under study gave positive response to potassium fertilization on peanut crop; and this indicated that the soil was deficient in K and needs to be fertilized with potassium carrier. The addition of 120 kg K ha^{-1} as potassium sulphate may be recommended for peanut plants in order to increase seed yield, oil and protein yields and nutrients uptake in seeds.

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تأثير مصادر ومستويات تسميد مختلفة من البوتاسيوم على إنتاجية الفول السوداني النامي تحت ظروف الأراضي الرملية

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أقيمت تجربتان حقليتان بمزرعة على مبارك بمحطة البحوث الزراعية بجنوب التحرير – مصر خلال موسمى الصيف ٢٠١٣ و٢٠١٤ وكان الهدف من الدراسة مقارنة تأثير مصادر البوتاسيوم ممثلة بسماد سلفات البوتاسيوم وسماد كلوريد البوتاسيوم ومعدلاتهما صفر، ٦٠، ١٢٠ كجم بوتاسيوم للهكتار على نمو نبات الفول السوداني ومحصوله وجودته تحت نظام الرى بالرش أيضا محتوى التربة من البوتاسيوم الميسر والكلوريد الذائب والتوصيل الكهربى بعد الحصاد. وقد أظهرت النتائج عدم وجود إختلافات معنوية بين سماد سلفات البوتاسيوم وسماد كلوريد البوتاسيوم فى تأثيرهم على إرتفاع النبات، عدد الأفرع للنبات، عدد القرون للنبات، محصول القرون والبذور للنبات، وزن المائة قرن، وزن المائة بذرة ، محصول القرون والبذور والقش ونسبة التقشير بالاضافة إلى محصول الزيت والبروتين وإمتصاص النيتروجين، الفوسفور والبوتاسيوم في البذور. أيضا لم يكن لمصادر البوتاسيوم تأثيراً معنوياً على محتوى التربة من البوتاسيوم الميسر والكلوريد الذائب والتوصيل الكهربى بعد الحصاد. بينما أظهرت النتائج أن إضافة السماد البوتاسي بمعدل ١٢٠ كجم بوتاسيوم للهكتار قد أحدث زيادة معنوية في الصفات المذكورة سابقاً فيما عدا النسبة المئوية للتقشير لم تتأثر معنوياً بمستويات البوتاسيوم. أيضاً أدى زيادة التسميد البوتاسي إلى زيادة معنوية في محتوى التربة من البوتاسيوم الميسر والكلوريد الذائب ومع ذلك لم ينشأ تراكم للأملاح بالتربة نتيجة التسميد البوتاسي فى الأراضي الرملية. معظم الصفات المدروسة تأثرت معنوياً بالتداخل بين مصادر البوتاسيوم ومستويات البوتاسيوم. وجد أن معاملة التفاعل بمعدل ١٢٠ كجم بوتاسيوم للهكتار على صورة سماد سلفات البوتاسيوم كانت الأكثر فاعلية حيث أعطت أعلى القيم في محصول البذور للنبات، وزن المائة بذرة، محصول القرون والبذور والقش.