Egyptian J. Desert Res., 56, No.1, 205-219 (2006)

EFFECT OF PHOSPHORUS AND POTASSIUM FERTILIZATIONS ON YIELD AND QUALITY COMPONENTS OF PEANUT (*Arachis hypogaea* L.) AT THE NORTH SINAI AREA IN EGYPT

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Two field experiments were carried out on the sandy soils with drip irrigation system at El-Sheakh Zowied Research Station of the Desert Research Center, North Sinai Area, in Egypt, during 2001/2002 and 2002/2003. All field trials were performed with the aim of studying the effect of three levels of phosphorus (15.5, 31.0 and 46.5 kg P_2O_5/fed.) and three levels of potassium (24, 36 and 48 kg K_2O/fed.) on productivity and quality components in three peanut (*Arachis hypogaea*, L.) varieties (namely,Giza-5, Giza-6 and Ismailia-1). The obtained results showed that the Ismailia-1 registered variety was superior to Giza-5 or Giza-6 according to yield and yield components. In addition, phosphorus fertilizer at the rate of 46.5 kg P_2O_5/fed. combined with potassium fertilizer at the rate of 48 kg K_2O/fed. have been given the highest significant values for seed yield (341.47 kg/fed.), for quality, yield and yield parameters. The phosphorus levels were significant for all varieties plant height, number of pods/plant, 100-seed weight and shelling percentage. Phosphorus and potassium levels showed significant effects inducing the highest 100-seed weight, shelling percentage, seed yield/fed., seed oil percentage and oil yield/fed. The three-factors interaction among the varieties, phosphorus and potassium levels proved to be highly significant as they induced the highest number of branches/plant and shelling percentage. It is concluded that Ismailia-1 was found to be the best that the utilize of the highest rates (46.5 kg P_2O_5/fed. and 48 kg P_2O_5/fed.). The varieties Giza-5, Giza-6 and Ismailia-1 gave the highest significant seed yield/fed. under the drip saline water irrigation conditions on sandy soil and combination of them can be recommended for the peanut.

Keywords: peanut (*Arachis hypogaea*, L.), El-Sheakh Zowied, North Sinai of Egypt, varieties, phosphorus and potassium fertilizers, salinity, quality, yield, yield components.

Peanut (*Arachis hypogaea*, L.) is one of the most important oil crops and food seed legume. It contains about 50% oil, 25-30% protein, 20% carbohydrates and 5% fiber and ash and makes a substantial contribution to human nutrition. In Egypt, oil production is not sufficient for the local consumption. So, it is of great importance to improve peanut production by several agricultural practices such as selecting promising varieties and applying balanced fertilization at a proper rate. Peanut crop can be grown successfully on the light textured soils, if conditions are favorable. On the other hand, soils of North Sinai Areas could be a promising area for the cultivating of this crop. Importance of this area can be increase when El-Salam channel completed, however, conditions of soil, its fertility and quality of the irrigation water may constitute a current problem for planting this crop at the wide scale. This research is an attempt to introduce peanut crop in this area under the condition of high soil salinity and irrigation water. This may necessitate beside the introduction of the crop a study to compare a number of promising varieties under different dosage applications of phosphorus and potassium fertilizers. Several investigators showed peanut varieties, differences in weight of pods; seed yield/plant, 100-seed weight and seed yield/fed. Among them, Shams El-Din and Ali (1996) recorded significant differences among peanut varieties in shelling percentage, as well as oil and protein yields/fed. Phosphorus considered being one of the important nutrients that required in large amount for the optimum growth, yield and quantity in oil seeds. Peanut responds well to higher levels of phosphorus fertilizations, especially in saline soil conditions. Peanut yields appeared to be gradually increased as P level increased under several conditions as reported by Patel (1992). Regarding potassium fertilizer, Patra *et al.* (1996) showed a positive response in yield of peanut to K fertilizer. Saha *et al.* (1994) indicated that, pod yield and yield components increased by K application. In addition, Patra *et al.* (1995) found that application of 45 kg K_2O/fed. increased the yield and yield components of the peanut. El-Far and Ramadan (2000) observed that application of 36 kg K_2O/fed. significantly increased number of branches/plant, pods weight/plant,100-seed weight, shelling percentage and pods yield/fed. in peanut. Similarly, Darwish *et al.* (2002) were noticed that adding 48 kg K_2O/fed. fertilizer was significantly increased seed and oil yields/fed. of peanut. Anton and Bassiem (1998) indicated that 100- seed weight and pod, and seed yields/ fed. of peanut were responded positively to application of potassium up to 48 kg/fed. under the sandy soils, peanut may required P , K fertilizers to improve the pods production and their quality. Nasr-Alla *et al.* (1998)

indicated that the number of branches/plant, yield of pods/plant, and per fed. of peanut increased as the rate of P and K increased as individual or combine. El-Far and Ramadan (2000) showed that application of 46.5 kg P_2O_5/fed. and 36 kg K_2O/fed. application had a highly significant positive effect on yield of peanut. The objective of this investigation was to study the response of yield components of some peanut varieties to phosphorus and potassium fertilizers under the conditions of sandy soil and irrigation with saline water using (2420ppm) drip irrigation system at El-Sheakh Zowied Research Station of the Desert Research Center, in North Sinai Area, in Egypt, during 2001/2002 and 2002/2003.

MATERIALS AND METHODS

Two field trials were carried out at El-Sheakh Zowied Research Station of the Desert Research Center at North Sinai governorate during the 2001/2002 and 2002/2003 to study the effect of phosphorus and potassium fertilizers on quality, yield and yield components in some peanut (*Arachis hypogaea*, L.) varieties (namely;Giza-5, Giza-6 and Ismailia-1).The experimental site's soil was sandy and irrigated through a drip irrigation system with water having 2420ppm salts. Physical (Black, 1965) and chemical (Jackson 1958) properties of the experimental soil was given in table (1).Irrigation water was analyzed to determine its contents of anions and cations at El-Sheakh Zowied Research Station (Table 2).The experimental treatments were designed as a split-split plot technique with four replicates. The main plots represented as the three varieties of peanut; namely Giza-5, Giza-6 and Ismailia-1 and sub-plots are three levels of phosphorus fertilization. Sub-sub-plots were designed as three levels of potassium fertilization; namely (24, 36 and 48 kg K_2O/fed.) (feddan = fed. = 4200 m^2). Phosphorus source was calcium super phosphate, which was applied at the rates of 15.5, 31.0 and 46.5 kg P_2O_5/fed. It was applied before sowing during the seedbed preparation. Another fertilizer is potassium, was applied in three equal doses such as (I)at sowing,(II)20 days after sowing and (III)40 days after sowing. The size of the experimental plot (sub-sub-plot) was 3x3.5m (= 10.5 m^2 = $^1/_{400}$ fed.), which included 7 rows. The rows were 0.5m apart and on row plants distance were 0.20 m. Seeding rate was 50kg peanut seeds/fed. Sowing was made on May 15, 2001 and May 18, 2002. Seeds were treated with vitavex prior to sowing. Three seeds were applied per hill then each hill was thinned after two weeks from sowing as two plants per hill. Nitrogen fixing bacterial strain was directly given into the soil after sowing. Ammonium sulfate (2o.5%N) fertilizer was applied at the rate of 30kg N/fed. at two equal doses; at sowing and 20 days afterwards. In addition, gypsum was applied at the beginning of flowering stage at the rate of 0.5ton/fed. Farmyard manure (FYM) at the rate of 20m^3/fed., was thoroughly mixed with 30cm upper part of the soil during the seedbed

preparation. The chemical composition of the FYM is listed in table (3). At harvest (105 days from sowing), the following characters were estimated on ten random plants in each sub-sub-plot in both seasons: plant height cm, number of branches/plant, number of pods/plant, pods weight/plant gm, seed weight/plant gm, 100-seed weight gm and shelling percentage. The latter is calculated from the following equation:

Shelling percentage = Seed yield (kg/fed.) / Pod yield (kg/fed.) X 100

In addition, a $3m^2$ plot in the middle of each replicate plot was harvested. Pods yield kg/fed., seed yield kg/fed., seed oil percentage and oil yield kg/fed., were estimated. Dry mature seeds were ground into very fine powder to determine oil percentage using Soxhlet apparatus and diethyl ether according to A.O.A.C. (1990). Oil yield was estimated by multiplying seed oil percentage by seed yield kg/fed. All obtained data was subjected to statistical analysis according to the procedures of analysis of variance (Snedecor and Cochran, 1981) and the least significant difference test was used to compare of the means (Gomez and Gomez, 1984).

TABLE (1). Some physical and chemical properties of representative soil sample from the experimental site

Soil property	Soil depth (cm)	
Partice size distribution	0-30	30-60
Sandy %	98.50	98.18
Silt %	0.69	0.85
clay %	0.51	0.57
Textural class	sandy	sandy
Organic matters %	0.023	0.052
PH (1: 1 water soil suspension)	7.81	7.83
EC (ds m^{-1})	0.68	0.75
$CaCO_3$ %	1.45	1.31
Soluble cations (meq / 100 g)		
Na^{+1}	1.56	1.16
K^{+1}	0.17	0.22
Ca^{+2}	1.04	1.25
Mg^{+2}	0.35	1.05
Soluble anions (meq 100 g)		
Cl^{-1}	1.05	1.11
HCO_3^{-1}	0.87	1.21
SO_4^{-2}	1.20	1.74

TABLE (2). The average values of chemical analysis of the used irrigation waters.

Season	pH	EC ppm	Soluble anions (meq/ L)				Soluble cations (meq/ L)			
			Ca^{+2}	Mg^{+2}	Na^{+1}	K^{+1}	CO_3^{-2}	HCO_3^{-1}	SO_4^{-2}	Cl^{-1}
2001/2002	8.1	2276	4.89	6.07	26.09	0.18	0.54	2.32	12.91	19.74
2002/2003	8.3	2565	5.47	7.37	26.93	0.19	0.68	3.07	10.58	26.31

TABLE (3). Some chemical properties of the applied farmyard manure

PH	EC ds/m	organic matter %	C%	N%	C/N
7.42	1.74	54.22	31.52	2.21	14.26

RESULTS AND DISCUSSION

1- Effect of the Seasonal Variations

Results in table (4) represent averages of the studied seasons. It is obvious from the results that all of the studied characters were showed significant differences between years. Greater yield and yield components in the first year as compared with those in the second can be explained with the salt accumulation and non-residual effects. This parameter was prominent in the number of pods/plant and weight of the 100 seeds (Table 4). These findings are in harmony with those found by El-Hosary *et al.* (2000).

TABLE (4). The average of seasonal effect on yield and yield components of peanut plants under the saline conditions at El-Sheakh Zowied.

Seasons	Plant height (cm)	Number of branches/ plant	Number of pods/ plant	Pod weight/ plant (gm)	Seed weight/ plant(gm)	100-seed weight (gm)	Shelling %	Pod yield (kg/fed.)	Seed yield (kg/fed.)	Seed oil %	Oil yield (kg/fed.)
2001/2002	26.03	7.97	10.01	11.20	5.06	42.36	45.08	717.46	306.56	38.39	118.71
2002/2003	28.77	7.31	9.46	10.64	4.71	41.44	44.01	582.39	240.97	36.59	89.99
L.S.D.	0.40	0.07	0.31	0.13	0.19	0.38	1.03	14.36	11.47	0.40	5.91

*L.S.D. at 0.05 level.

Effect of the Used Varieties

Data in yable (5) indicate that there are significant differences among the studied varieties as averaged across other treatments and both years of the study in approximately all studied traits. Ismailia-1 could significantly surpassed Giza-5, for investigated parameters such as plant height, no. of branches/ plant, no. of pods/ plant, pods weight/ plant, seed weight/ plant,

100- seed weight, shelling percentage, pods/ yield/ fed., seed yield/ fed., oil percentage in seeds, and oil yield/ fed. Inherited genetic variability reflects to each variety more than effects imposed on the plants by the applied treatments. These findings are in line with Sarhan (2001), and Abd–Alla (2004) and Ali *et al.* (2004). Generally, Ismailia-1 surpassed Giza-6 and Giza-5 for the most yields and yield components in this study.

TABLE (5). Effect of varieties, Phosphorus and potassium fertilizers on yield and yield components of peanut under the saline conditions at El- Sheakh Zowied.

Treatments	Plant height (cm)	Number of branches/ plant	Number of pods/ plant	Pod weight/ plant(gm)	Seed weight/ plant(gm)	100-seed weight (gm)	Shelling %	Pod yield (kg/fed.)	Seed yield (kg/fed.)	Seed oil %	Oil yield (kg/fed.)
Peanut varieties											
Giza 5	24.33	6.45	8.52	9.62	4.11	40.28	42.84	575.93	230.68	35.91	83.59
Giza 6	28.06	7.94	9.88	11.08	4.97	41.96	44.71	661.72	278.61	37.64	99.80
Ismailia-1	29.81	8.52	10.80	12.05	5.59	43.46	46.08	712.13	312.01	38.92	127.65
L.S.D.	0.49	0.09	0.38	0.15	0.23	0.46	1.26	17.59	14.04	0.49	7.24
Phosphorus levels (kg/fed)											
15.5	24.86	6.66	8.74	9.98	4.31	40.80	43.14	596.86	242.57	36.51	89.90
31	27.16	7.84	9.83	10.95	4.91	41.94	44.64	651.84	274.57	37.44	104.26
46.5	30.19	8.42	10.63	11.82	5.45	42.96	45.85	701.07	304.16	38.51	118.89
L.S.D.	0.41	0.17	0.15	0.24	0.09	0.20	0.33	15.03	4.38	0.19	2.56
Potassium levels (kg/fed)											
24	26.13	6.68	9.08	10.00	4.36	40.85	43.26	596.77	242.97	38.46	93.45
36	27.26	7.34	9.89	10.94	4.87	41.91	44.57	653.15	272.76	37.42	103.36
48	28.81	7.90	10.25	11.81	5.44	42.94	45.80	699.86	305.57	36.59	111.81
L.S.D.	0.53	0.11	0.13	0.11	0.09	0.14	0.14	6.03	3.05	0.09	2.15

*L.S.D. at 0.005 level.

Effect of Phosphorus Application

It was observed a clear increase the P levels from 15.5 to 46.5 kg P_2O_5/fed.; gradually increased all yield components for the plant height, number of branches/plant, number of pods/plant, pods weight/plant, seed weight/plant, 100-seed weight, shelling percentage, pods yield/fed., seed yield/fed., oil percentage in seeds, and oil yield/fed. (Table 5). Since P fertilization had promising effects on yield and yield components which resulted in producing more pods, seeds and oil yields per unit area. Similar results were obtained by Anton and Bassiem (1998), and El-Far and Ramadan (2000) who indicated that increasing P levels was always induced the increasing in yield and yield parameters of peanut. This can be explained as the phosphorus mineral encourages the cell division and cell elongation in the meristematic region of the plant, besides the nitrogen fixation. The

increase in vegetative growth owing to P application induced more pods/ plant production and improved seed weight. In this respect, maximum pod weight/ plant up to 11.82 gm / plant was recorded with application of 45.5 kg P_2O_5 /fed., however it was 18.44 % higher over the control (15.5 kg P_2O_5 /fed.) These effects could be reflected in overall yield of crop, recording the highest pods yield/ fed, seed yield/ fed. and oil yield/ fed. by 701.07 kg, 304.16 kg and 118.89 kg with 46.5 kg P_2O_5 /fed , being 17.46%, 25.39% and 32.25% higher over the control treatment (15.5 kg P_2O_5 /fed.), respectively (Table5). The results are in accordance with MaJumdar *et al.* (2001).who mentioned that application of P significantly increased seed oil percentage of peanut and also the application of 31 and 46.5 kg P_2O_5 /fed., increased of the seed oil percentage in peanut significantly as compared with 15.5 kg P_2O_5. This increase represents 2.55% and 5.48%, respectively. Shelling percentage increased significantly with 46.5 kg P_2O_5 /fed. by 5.87 % over 15.5 kg P_2O_5 /fed. (Table 5). Observed improvement in the yield of peanut was attributed to the increase of P application which resulted in root development. These results agreed with and verified by Samanta *et al.* (1993) and Rao *et al.* (2002).

Effect of Potassium Application

Levels of potassium fertilizer had a highly significant effect on all studied traits for the plant height, number of branches/plant, number of pods/plant, pods weight/plant, seed weight/plant, 100-seed weight, shelling percentage, pod yield/fed., seed yield/fed., seed oil %, and oil yield/fed. (Table 5).This effect can be explained as its essential role in growth and establishment of peanut plants. In addition, this mineral has an important rate of the plants as a part and functioning of enzymes in all plant biological processes, which leads to increasing yield components. In this respect, Patra *et al.* (1995) and Nasr-Alla *et al.* (1998), are in agreement with and verified these results. Researchers found that potassium application proved to be highly beneficial for plants in general and shelling percentage, pod and seed yields/fed. which, gradually increased with K level increased from 24 to 36 and 48 kg K_2O/fed. This increases represent 5.87%, 17.27%, 25.76% 19.7% in combined data for both seasons. Obtained results followed the same patterns of other yield attributes confirmed the vital role of K element in growth and improvements of productivity of peanut. Such results may due to adequacy of K applied that in turn favors the plant growth and productivity of peanut. These results means that soil K content is not fairly enough for the requirements of peanut under such conditions. Similar results were obtained by Ahmed and Zeidan (2001), and Darwish *et al.* (2002).

Application of 48 kg K_2O/fed. gave the highest values of all investigated yield and yield components (Table 5). But, Dahdouh (1999) and Ali and Mowafy (2003) indicated that increasing potassium fertilizer rate from 24 to 48 kg K_2O/fed. induced a significant reduction of oil percentage

in seeds on sandy soil. Researcher attributed such decrement for oil percentage from the seeds to the dilution effect including increase of seed size and weight. In this connection, Anton and Bassiem (1998) stated that seed oil percentage slightly increased when peanut plants received high value of K fertilizer at the rate of 48 kg K_2O/fed.

Effect of Interaction Between Varieties and Phosphorus

Table (6) indicates that plant height, number of pods/plant, 100-seed weight and shelling percentage increased significantly as 32.94, 11.72, 44.58 and 47.74% for Ismailia-1 when phosphorus fertilizer dosage increased to 46.5 kg P_2O_5/fed. But number of branches/plant, pod weight/plant, seed weight/plant, pod yield/fed., seed yield/fed., seed oil percentage, and oil yield/fed. were not significantly affected by this interaction treatment compared with the others (Giza-5 and Giza-6 adopted in this study). Obtained results revealed that phosphorus fertilization highly significantly increase the shelling percentage for all varieties as 44.09%, 45.71% and 47.74% from Giza-5, Giza-6 and Ismailia-1 respectively. The highest shelling percentage was obtained from 46.5 kg P_2O_5/ fed. fertilization and the lowest shelling percentage was obtained from 15.5 kg P_2O_5/ fed. fertilization (Table 6). This point indicates that phosphorus has a vital role for increasing seeds weight on pod. Results were verified by Ali *et al.* (1995) and El-shahat (2001) who found that plants of Ismailia-1 variety could significantly surpass those of the other two varieties under study. Such results indicated that a greater efficiency in Ismailia-1 for the utilizing of phosphorus as compared with another two varieties (Giza-5 and Giza-6) under the environmental conditions of this study. All obtained results were agreed with Ali (1990) and Patra *et al.* (1996) and Migawer *et al.* (2001).

TABLE (6). Effect of interaction between varieties and phosphorus fertilizer on yield and yield components of peanut plants under the saline conditions at El- Sheakh Zowied.

Peanut Varieties	Phosphorus levels (kg/fed)	Plant height(cm)	Number of branches/ plant	Number of pods/plant	Pod weight/ plant(gm)	Seed weight/ plant(gm)	100-seed weight (gm)	Shelling %	Pod yield (kg/fed.)	Seed yield (kg/fed.)	Seed oil %	Oil yield (kg/fed.)
Giza 5	15.5	21.91	5.31	7.59	8.67	3.50	39.39	41.48	521.16	199.95	34.78	70.04
	31.0	24.09	6.70	8.44	9.63	4.15	40.17	42.95	577.93	231.32	35.79	83.47
	46.5	26.99	7.35	9.54	10.56	4.67	41.28	44.09	628.70	260.76	37.14	97.51
Giza 6	15.5	26.12	6.92	8.96	10.18	4.48	40.64	43.73	610.59	248.94	36.76	92.42
	31.0	27.44	8.20	10.02	11.08	4.91	42.24	44.71	658.79	276.27	37.70	105.27
	46.5	30.63	8.70	10.65	12.00	5.52	43.01	45.71	715.76	310.62	38.48	120.68
Ismailia-1	15.5	26.54	7.75	9.68	11.09	4.94	42.37	44.21	658.84	278.81	38.01	107.03
	31.0	29.95	8.62	11.01	15.15	5.67	43.42	46.21	718.81	316.12	38.89	124.04
	46.5	32.94	9.20	11.72	12.90	6.16	44.58	47.74	758.74	341.09	39.91	138.48
L.S.D.		0.70	N.S.	0.26	N.S.	N.S.	0.34	0.57	N.S.	N.S.	N.S.	N.S.

*L.S.D. at 0.05 level. N.S.= not significant

Effect of Interaction Between Varieties and Potassium

Pods weight/plant, seed weight/plant, 100-seed weight, shelling percentage, pods yield/fed., seed yield/fed., seed oil percentage, and oil yield/fed. increased significantly (13.03 gm , 6.24 gm , 44.41 gm ,47.62 %, 762.21 kg /fed.,349.49 kg /fed.,37.90 %.,132.46 kg/fed.) respectively for the investigated varieties by increasing potassium application rate up to 48 kg K_2O/fed., While plant height, number of branches/plant and number of pods/plant were not significantly, 31.09 cm, 9.09 branches/plant, 11.35 pods/plant affected (Table7). Ismailia-1 showed greater positive response regarding the studied parameters if compared with Giza-5 and Giza-6 in respect of the highest values for the mentioned parameters(Table7). Seed oil percentage did not follow a clear trend regarding its response but pods, seed and oil yields /fed. were found to be higher in Ismailia-1 than other cultivars. In addition, Ismailia-1 had the highest pod, seed and seed oil yields/fed. in response to application of 48 kg K_2O /fed. fertilization has been given the highest values for examined yield and yield components and the increases happened gradually with 24 to 36 and 48 kg K_2O/fed. (Table7). Obtained results agreed with Ahmed and Zeidan (2001), Migawer *et al.* (2001) and Abd-Alla (2004).

TABLE (7). Effect of interaction between varieties and potassium fertilizer on yield and yield components of peanut plants under the saline conditions at El-Sheakh Zowied.

Peanut Varieties	Potassium levels (kg/fed)	Plant height (cm)	Number of branches/ plant	Number of pods/plant	Pod weight/ plant(gm)	Seed weight/ plant(gm)	100-seed weight (gm)	Shelling %	Pod yield (kg/fed.)	Seed yield (kg/fed.)	Seed oil %	Oil yield (kg/fed.)
Giza 5	24	23.19	5.79	7.95	8.84	3.72	39.07	41.88	527.89	206.34	36.77	75.87
	36	23.79	6.51	8.66	9.74	4.08	40.28	42.82	585.52	232.16	35.87	84.04
	48	26.00	7.06	8.96	10.28	4.52	41.49	43.82	614.38	253.53	35.08	88.94
Giza 6	24	26.73	7.35	9.19	10.05	4.35	40.98	43.28	599.21	242.84	38.57	93.66
	36	28.12	7.94	10.01	11.09	5.01	41.99	44.90	662.94	279.29	37.58	105.88
	48	29.35	8.54	10.44	12.11	5.55	42.92	45.97	723.01	313.69	36.79	115.41
Ismailia-1	24	28.47	7.95	10.09	11.12	5.01	42.51	44.63	663.20	279.71	40.04	111.99
	36	29.87	8.52	10.97	11.99	5.52	43.45	45.99	710.98	306.82	38.82	120.16
	48	31.09	9.09	11.35	13.03	6.24	44.41	47.62	762.21	349.49	37.90	132.46
L.S.D.		N.S.	N.S.	N.S.	0.18	0.15	0.24	0.24	10.45	5.29	0.16	3.72

*L.S.D. at 0.05 level. N.S.= not significant

Effect of Interaction Between Phosphorus and Potassium

Under sandy soil conditions, peanut requires P and K fertilizers to improve its dry matter pods production and its quality. Obtained data in table (8) indicate that the effect of interaction between phosphorus and potassium fertilization rates on yield and yield components of peanut are significant for

100-seed weight, shelling percentage, seed yield/fed., seed oil percentage and oil yield/fed. Generally, it was observed that increasing the levels of both nutrient elements markedly increased all the examined plant growth traits. The highest values of these parameters were recorded with the application of the highest rates of both elements. Therefore, the highest values of 100- seed weight (44.10 gm), shelling percentage (47.09%), seed yield (341.47 kg/fed.) and Oil yield (128.02 kg/fed.) were achieved by high level of 48 kg K_2O/fed. when 46.5 kg P_2O_5/fed. was applied. Otherwise, low levels of both fertilizers produced the lowest values of 100- seed weight, shelling percentage, seed yield fed. and oil yield/fed.(Table 8). On the other hand, observed results showed that increasing K level tended to decrease significantly seed oil%. However, the lowest seed oil % was obtained by high level of K 48 kg K_2O /fed. The highest oil yield/ fed. was achieved by the high level of K 48 kg K_2O by Yakadri *et al.*(1992). In this connection, Anton and Bassiem (1998) reported that pods weight/plant, seed weight/plant, straw weight/plant and 100-seed weight traits reached to maximum in response to the highest application rates for all nutrients. These results attributed to the beneficial simultaneous effect of P and K on both inoculums activity (rhizobium) and plant growth. These effects showed up in the form of enhanced growth parameters. Migawer *et al.* (2001) and Ali and Mowafy (2003) reported similar results. However, Dahdouh (1999), in sandy soil, proved that feeding peanut plants with 24, 36 up to 48 kg K_2O/fed. indicated a significant decrement in oil percentage of peanut seeds. On the other hand, increasing P application rate proved to increase oil yield (kg/fed.) significantly according to Anton and Bassiem (1998). This may due to the increase in P application from 30 to 50 kg P_2O_5/fed. combined with the application of 48 kg K_2O/fed. which increased seed oil content of peanut (Table 8).This can be explained on the basis of that increasing P and K together activated the formation of both amino and fatty acids.

TABLE (8). Effect of interaction between phosphorus and potassium fertilizers on yield and yield components of peanut plants under the saline conditions at El-Sheakh Zowied.

Phosphorus levels (kg/fed)	Potassium levels (kg/fed)	Plant height (cm)	Number of branches/ plant	Nnmber of pods/ plant	Pod weight/ plant(gm)	Seed weight/ plant(gm)	100-seed weight (gm)	Shelling %	Pod yield (kg/fed.)	Seed yield (kg/fed.)	Seed oil %	Oil yield (kg/fed.)
15.5	24	24.01	6.00	8.10	9.15	3.87	39.92	42.06	546.81	216.26	37.39	80.86
	36	24.51	6.67	8.86	10.00	4.22	40.75	43.03	598.73	240.84	36.47	88.88
	48	26.06	7.31	9.26	10.80	4.83	41.73	44.33	645.06	270.61	35.68	96.55
31.0	24	25.66	7.32	9.17	10.03	4.35	40.89	43.18	596.28	244.05	38.42	93.76
	36	26.99	7.79	9.98	10.99	4.96	41.95	44.77	654.44	275.03	37.32	103.82
	48	28.83	8.41	10.33	11.83	5.42	42.99	45.98	702.81	304.63	36.59	111.46
46.5	24	28.73	7.76	9.96	10.84	4.86	41.76	44.55	645.21	268.59	39.57	106.28
	36	30.28	8.52	10.79	11.83	5.43	43.02	45.91	706.27	302.41	38.47	117.38
	48	31.55	8.98	11.15	12.79	6.06	44.10	47.09	751.73	341.47	37.49	128.02
L.S.D.		N.S.	N.S.	N.S.	N.S	N.S	0.24	0.24	N.S	5.29	0.16	3.72

*L.S.D. at 0.05 level. N.S.= not significant

Effect of Interaction Among Varieties, Phosphorus and Potassium

Data obtained for the interaction among the three tested factors (varieties x phosphorus x potassium) are depicted in Table (9). The results indicate that such interaction had a significant influence on the average number of branches/plant (9.85) and shelling percentage(49.47 %) in Ismailia-1. Enhanced values of yield were obtained in response to fertilizer treatment 46.5 kg P_2O5/fed. and 48 kg K_2O/fed. plants of Ismailia-1 variety significantly surpassed the other two varieties of Giza-5 and Giza-6 regarding the utilization of both phosphorus and potassium under the environmental conditions of this study at El-Sheakh Zowied in North Sinai. The Ismailia-1 peanut variety proved to be promising in the study area, especially under saline irrigation water conditions.

TABLE (9). Effect of interaction among varieties, phosphorus and potassium fertilizers on yield and yield components of peanut plants under the saline conditions at El- Sheakh Zowied.

Peanut varieties	Phosphorus levels (kg/fed)	Potassium levels (kg/fed)	Plant height (cm)	Number of branches/ plant	Number of pods/ plant	Pod weight/ plant (gm)	Seed weight/ plant(gm)	100-seed weight (gm)	Shelling %	Pod yield (kg/fed.)	Seed yield (kg/fed.)	Seed oil %	Oil yield (kg/fed.)
Giza 5	15.5	24	21.78	4.85	7.25	8.10	3.30	38.45	40.58	486.45	181.32	35.65	64.64
		36	20.87	5.20	7.63	8.74	3.28	39.23	41.20	525.37	199.68	34.70	69.90
		48	23.07	5.88	7.88	9.18	3.93	40.48	42.65	551.67	218.85	34.00	74.41
	31.0	24	22.57	5.83	7.82	8.80	3.69	38.95	41.87	528.13	206.68	36.57	75.58
		36	23.70	6.95	8.62	9.82	4.22	40.15	42.90	589.82	233.92	35.77	84.22
		48	26.00	7.32	8.89	10.27	4.53	41.42	44.08	615.85	253.35	35.03	88.75
	46.5	24	25.22	6.68	8.77	9.63	4.17	39.82	43.20	569.10	231.03	38.10	88.02
		36	26.82	7.39	9.73	10.67	4.74	41.45	44.37	641.37	262.87	37.13	98.02
		48	28.93	7.97	10.11	11.38	5.10	42.58	44.72	675.63	288.38	36.20	104.39
Giza 6	15.5	24	24.97	6.12	8.27	9.17	3.91	39.75	42.48	547.98	214.20	37.53	80.39
		36	26.07	6.81	9.14	10.22	4.50	40.68	43.87	613.65	250.75	36.73	92.83
		48	27.33	7.84	9.48	11.14	5.01	41.50	44.83	670.15	281.88	36.00	101.48
	31.0	24	26.17	7.86	9.29	10.03	4.28	41.22	43.15	593.87	241.93	38.67	93.55
		36	27.22	8.07	10.14	11.04	4.99	42.22	44.98	658.12	278.00	37.60	105.28
		48	28.95	8.68	10.64	12.17	5.45	43.28	45.98	725.40	308.87	36.83	113.76
	46.5	24	29.05	8.07	10.01	10.94	4.85	41.97	44.20	655.77	272.40	39.50	107.60
		36	31.07	8.93	10.74	12.01	5.52	43.07	45.85	717.05	309.13	38.40	119.52
		48	31.77	9.11	11.19	13.03	6.18	43.98	47.08	774.47	350.32	37.53	131.47
Ismailia-1	15.5	24	25.27	7.04	8.79	10.17	4.40	41.55	43.10	606.00	253.25	39.00	98.77
		36	26.58	7.99	9.81	11.04	4.89	42.33	44.03	657.17	272.08	37.97	103.92
		48	27.77	8.21	10.43	12.07	5.54	43.22	45.50	713.35	311.10	37.05	115.26
	31.0	24	28.23	8.28	10.39	11.26	5.08	42.50	44.53	672.83	283.53	40.02	113.47
		36	30.07	8.34	11.19	12.13	5.66	43.48	46.42	715.40	313.17	38.60	121.97
		48	31.55	9.22	11.47	13.06	6.28	44.28	47.88	768.18	351.67	37.90	133.28
	46.5	24	31.92	8.54	11.10	11.94	5.55	43.48	46.25	710.77	302.35	41.10	124.26
		36	32.97	9.22	11.90	12.81	6.01	44.53	47.52	760.38	335.22	39.88	134.60
		48	33.95	9.85	12.15	13.95	6.91	45.73	49.47	805.08	385.72	38.75	149.46
L.S.D.			N.S.	0.32	N.S.	N.S.	N.S.	N.S.	0.42	N.S.	N.S.	N.S.	N.S.

*L.S.D. at 0.05 level. N.S.= not significant

REFERENCES

Abd-Alla, Maha, M. (2004). Effect of Certain Agricultural Practices on Productivity of Peanut. I. Influence of Sowing Dates And Potassium Application on Yield and Yield Attributes of some Peanut Cultivars. *Zagazig J. Agric. Res.*, 31(3): 843-866.

Ahmed, M.K.A. and M.S. Zeidan (2001). Yield and quality of two peanut cultivars (*Arachis hypogaea* L.) as affected by methods of potassium application. *Egypt. J. Appl. Sci.*, 16(7): 114-126.

Ali, A.A.G; E.H. Fayed; H.A. Basha and A.M. Hassan (1995). Response of peanut to some agricultural practices. III. Influence of sowing dates and application of phosphorus and gypsum on quality of peanut. *Zagazig J. Agric. Res.*, 22 (2): 349-366.

Ali, A.A.G. and S.A.E. Mowafy (2003). Effect of Different Levels of Potassium and Phosphorus Fertilizers with the Foliar Application of Zinc and Boron on Peanut in Sandy Soils. *Zagazig J. Agric. Res.*, 30 (2): 335-358.

Ali, A.A.G.; O.A. Zeiton; H.G.M. Geweifel and M.A. Taha (2004). Some factors affecting productivity of peanut (*Arachis Hypogaea L*)in newly cultivated sandy soil. *Zagazig J. Agric. Res.*,31(6): 2565-2595.

Anton, N.A. and M.M. Bassiem (1998). Effect of phosphorus and potassium fertilizers and foliar spray with ascorbic and citric acids on peanut plant under sandy soil conditions. *Zagazig J. Agric. Res.*, 25(5): 733-742.

A.O.A.C., Association of Official Analysis Chemists (1990). In "*Official Methods of Analysis*". Published by the Association of Official Analysis Chemists, 15th ed., Washington, D.C., U.S.A.

Black, C.A. (1965).In "*Methods of Soil Analysis: Physical Mineralogical Properties Including Statistics of Measurement and Sampling*". Part 1. Am. Soc. Agron. Inc. Pub., Wisconsin, USA.

Dahdouh, S.M.N. (1999). Effect of K fertilization, sulfur and spray of calcium chelate on peanut in a newly reclaimed soil. *Zagazig J. Agric. Res.*, 26(2): 457-467.

Darwish, D.S.; E-G. El-Gharreib; M.A. El-Hawary and O.A. Raffi (2002). Effect of some macro- and micro-nutrients application on peanut production in a saline soil in El-Faiyum Governorate. *Egypt. J. Appl. Sci.*, 17(4): 17-32.

El-Far, I.A. and B.R. Ramadan (2000). Response of yield, yield components and seed quality of peanut to plant density and PK fertilization in sandy calcareous soil. *Proceedings 9th Conference of Agronomy Dept., Fac. Agric., Minufiya Univ., Egypt, Sept.* 1-2, p 453-466.

El-Hosary, A.A.; M.E. Riad.; Nagwa, R. Abd-El-Fattah and Manal, A. Hassan (2000). Effect of nitrogen fertilizer treatments on some durum wheat cultivars. *Proceedings 9th Conference of Agronomy Dept., Fac. Agric., Minufiya Univ., Egypt, Sept.* 1-2, p 119-133.

El-Shahat, A.M. (2001). Effect of Planting Density, Phosphorus and Foliar Application of Growth, Yield and Root System of Groundnut in Newly Cultivated Land. *M. Sc. thesis, Fac. Agric., Zagazig Univ., Egypt.*

Geweifel, H.G. and A.A.G. Ali (1990). Response of peanut yield to phosphorus and Kylar in newly reclaimed soils. *Proceeding 4th Conference of Agronomy Dept., Fac. Agric., Cairo Univ., Egypt, Sept.* 15-16, p 177-189.

Gomez, K.A. and A.A. Gomez (1984).In" *Statistical Procedures for Agricultural Research*". 2nd ed. John Willey and Sons.

Jackson, M.L. (1958). In "*Soil Chemical Analysis*". Printice Hall, Inc., Englewood Cliffs, N.J. Library of Congress, USA. 38; 325.

Majumdar, B.; M.S. Venkatesh; B. Lal; Kailash Kumar, and C.S. Singh (2001). Effect of phosphorus and zinc nutrition on groundnut in acid hapludalf of Meghalaya. *Annals Agri. Res.*, 22 (3): 354-359.

Migawer, Ekram. A. and Mona A.M. Soliman (2001). Performance of two peanut cultivars and their response to NPK fertilization in newly reclaimed loamy sand soil. *J. Agric. Sci., Mansoura Univ.*, 26 (11): 6653- 6667.

Nasr-Alla, A.E.; Fatma A.A. Osman and K.G. Soliman (1998). Effect of Increased Phosphorus, Potassium or Sulfur Application in Their Different Combinations on Yield, Yield Components and Chemical Composition of Peanut in a Sandy Reclaimed Soil. *Zagazig J. Agric. Res.*, 25(3): 557-579.

Patel, J.K. (1992). Influence of nitrogen, phosphorus and cultural methods on the yield of groundnut under rainfed situation. *Advances Plant Sci.*, 5(1): 1-5.

Patra, A.K.; S.K. Tripath and R.C. Samui (1995). Response of rainfed groundnut to potassium with varying levels of nitrogen. *J. Potassium Res.*, 11: 327-331.

Patra, A.K.; S.K. Tripath and R.C. Samui (1996). Seasonal variation in growth and yield of groundnut at different levels of N and K. *Indian J. Plant Physiology*, 38(3):218-223.

Saha, B.C.; A.K. Singharoy and B.K. Madal (1994). Effect of application of potassium on yield and yield components of summer groundnut in acid terai soil of North Bengal. *J. Potassium Res.*, 10 (1): 73-77.

Sarhan, A.A. (2001). Behaviour and productivity of two peanut cultivars undr agricultural system. *Zagazig J. Agric. Res.*, 28(6): 1009-1034.

Shams El-Din, G.M. and E.A. Ali (1996). Upgrading productivity of two peanut *(Arachis hypogaea* L.*)* varieties through applying optimum plant spacing and micronutrients application. *Arab Univ. J. Agric. Sci., Ain shams Univ., Cairo,* 4(1/2): 53-67.

Snedecor, G.W. and W.G. Cochran (1981).In "*Statistical Methods*". 7th ed., The Iowa State Univ. Press, Iowa, Ames, USA., p. 325-330.

Yakadri, M.; M.M. Husain and V. Satyanarayana (1992). Response of rainfed groundnut to potassium with varying levels of nitrogen and phosphorus. *Indian J. Agron.*, 37(1): 202-203.

Received: 18/01/2006
Accepted: 03/08/2006

تأثير التسميد الفوسفاتي والبوتاسى على المحصول ومكونات الجودة فى الفول السودانى بمنطقة شمال سيناء فى مصر

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أقيمت تجربتان حقليتان بمحطة بحوث الشيخ زويد التابعة لمركز بحوث الصحراء بمحافظة شمال سيناء خلال صيف موسمي ٢٠٠١/٢٠٠٢، ٢٠٠٢/٢٠٠٣ لدراسة تأثير مستويات التسميد الفوسفاتي (١٥,٥، ٣١,٠، ٤٦,٥ كجم فو٢أ٥/فدان) ومستويات التسميد البوتاسى (٢٤، ٣٦، ٤٨ كجم بو٢أ/فدان) على جودة وإنتاجية ثلاثة أصناف من الفول السوداني (جيزة ٥، جيزة ٦، إسماعيلية ١) تحت ظروف الأراضي الرملية ونظام الرى بالتنقيط بمياه الآبار التى تحتوي على أملاح كلية تقدر بنحو ٢٤٢٠ جزء في المليون وكانت أهم النتائج المتحصل عليها مايلى:

تفوق الصنف إسماعيلية ١ على بقية الأصناف في كل الصفات تحت الدراسة. كما تفوق معدل التسميد الفوسفاتي (٤٦,٥ كجم فو٢أ٥/فدان) ومعدل التسميد البوتاسى (٤٨ كجم بو٢أ/فدان) مقارنة بمستويات التسميد الفوسفاتي والبوتاسى الأخرى وقد أدى ذلك إلى زيادة كل الصفات تحت الدراسة. وقد أظهر التفاعل بين الأصناف والتسميد الفوسفاتي تأثير معنوي على طول النبات، عدد القرون للنبات، وزن المائة بذرة، نسبة التقشير % , كذلك أظهر التفاعل بين الأصناف والتسميد البوتاسى تأثير معنوي على وزن قرون النبات، وزن بذور النبات، وزن المائة بذرة، نسبة التقشير %، محصول القرون/فدان، محصول البذور/فدان، نسبة الزيت %، محصول الزيت/فدان. بينما أدى التفاعل بين السماد الفوسفاتي والبوتاسى إلى حدوث زيادة معنوية في وزن المائة بذرة، نسبة التقشير %، محصول البذور/فدان، نسبة الزيت، محصول الزيت/فدان. وقد أدى التداخل بين الأصناف والتسميد الفوسفاتي والبوتاسى تأثير معنوي في عدد فروع النبات، ونسبة التقشير%.

من خلال الدراسة يمكن التوصية بإدخال وزراعة الفول السوداني فى شمال سيناء ومع دخول مياة النيل بترعةالسلام يوصى بزراعة أصناف ذات إنتاجية عالية خاصة الصنف إسماعيلية– ١. مع الأهتمام بالمعاملات الزراعية حيث أنها أراضى رملية على أن يتم الرى بالتنقيط مع مراعاة الإهتمام بإضافة التسميد الفوسفاتي والبوتاسى بمعدلات ٤٦,٥ كجم فو٢أ٥/فدان، و ٤٨ كجم بو٢أ/فدان على الترتيب.